2021-2022

RESEARCH + MANAGEMENT REPORT

Game Species Conservation and Management

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2021-22 RESEARCH & MANAGEMENT REPORT

Maine Department of Inland Fisheries and Wildlife protects and manages Maine's fish and wildlife and their habitats, promotes Maine's outdoor heritage, and safely connects people with nature through responsible recreation, sport, and science.

Game Species Conservation & Management

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» Bird Conservation & Management

» Reptile, Amphibian, and Invertebrate Conservation & Management

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MAMMAL CONSERVATION & MANAGEMENT

The Mammal Group develops and oversees Maine's mammal monitoring and management programs, assists with permit reviews, and provides technical assistance to policy makers and the public. We address public and departmental informational needs by designing and implementing research programs, assisting with strategic planning, contributing to the Department's environmental education efforts, and responding to public information requests. We also make regulatory recommendations on hunting and trapping of mammals to the Wildlife Division Director. We conduct all regulatory recommendations, planning, and research in close cooperation with regional wildlife biologists in the Wildlife Management section.

Meet the Game Mammal Group

Craig McLaughlin, Ph.D.
Wildlife Research and Assessment Section Supervisor/Acting Mammal Group Leader

Craig supervises the Section and supports the Mammal Group's conservation and management programs. As one of the Department's primary liaisons with research programs at the University of Maine and other regional universities, he facilitates partnerships that strengthen the Department's research programs. These programs provide science to inform management that conserves both common and uncommon species statewide.

Nathan Bieber
Wildlife Biologist
Deer

Nathan oversees deer management system implementation, working closely with a team of regional biologists to make recommendations for allocating Any-Deer Permits and analyze hunter harvest and biological data. He also organizes MDIFW's chronic wasting disease monitoring efforts and serves as the departmental spokesperson on white-tailed deer issues. Nathan and the Cervid Working Group are updating the deer management system to address the priorities described in the Department's new Big Game Management Plan. He is also currently collaborating with a team of biologists on a deer winter survival study in Maine and New Brunswick.

Lee Kantar
Wildlife Biologist
Moose

Lee oversees Maine's Moose Management program. Lee's work involves conducting aerial moose surveys, collecting and analyzing biological information from moose, making hunting permit recommendations, and serving as the departmental spokesperson on moose. Lee led research on Adult Cow and Calf Survival (2014-2020) with cooperators and counterparts in NH/VT. He is continuing research on moose and winter ticks thru the implementation of an Adaptive Hunt Unit in northwestern Maine as well as continued collaboration with northeastern wildlife agencies and universities to assess moose populations in Maine as well as the northeast. This work will continue to inform the moose management system to address priorities described in the Department's Big Game Management Plan.

Jennifer Vashon
Wildlife Biologist
Black Bear and Canada Lynx

Jennifer oversees the management of black bears and Canada lynx – a federally-threatened species. Jen designs and implements surveys and monitoring plans for bears and lynx and analyzes biological data for these species. She is the departmental spokesperson for lynx and bear, makes annual recommendations for harvesting black bears, and provides technical support on bear and lynx issues to stakeholders in Maine and other states. Jen also ensures that the Department meets its obligations under the federal Incidental Take Permit for Canada lynx.

Shevenell Webb
Wildlife Biologist
Furbearers

Shevenell oversees the management of furbearers, work that involves monitoring populations, developing a new Furbearer Management Plan, conducting research, recommending trapping regulations, and serving as the departmental spokesperson for furbearers. Shevenell is participating in several research projects, including a study to determine the most effective way to monitor Maine's marten and fisher populations.

MAMMAL GROUP CONTRACT WORKERS AND VOLUNTEERS

Deer Project
Laura Williams
Wendell Harvey
Sue Kelly
Holly Bates
Gerry Lavigne
Eldon McLean
Paul Campbell
Tim Lentz
Braden Richard
Jackie Morton
Jacob Seehusen
Bailey Clock
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Moose Project
Randy Cross
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Jake Feener
Zack Gadow
Colleen Kostovick
Ethan Lamb
Evan Whidden
Carl Tugend

Furbearers
Bryn Evans
Jacob Seehusen
Tegwin Taylor
Sara Beck
Valerie Wright
Maggie Hayes
Tessa Baillargeon

WHITE-TAILED DEER

Nathan Bieber

Few species conjure up images of wilderness while simultaneously bringing wilderness close to home like the white-tailed deer. This adaptable creature's range stretches across all 48 lower U.S. states, north to the Yukon Territory, and south to Peru. Whitetails inhabit all corners of Maine, so whether you are an avid wildlife watcher or photographer, big woods tracker, or urban archer, there's an experience with Maine's whitetails waiting for you.

2021 Harvest Information

SEASON DATES AND STRUCTURE

MDIFW manages deer primarily by issuing any-deer permits and establishing regulated hunting seasons, including the expanded archery season, the regular archery and crossbow season, Youth Day, Residents' Day, the regular firearms season, and two muzzleloader seasons. In 2021, there were 79 hunting days for Maine deer hunters to pursue whitetails.

PERMIT ALLOCATION

MDIFW develops any-deer permit (ADP) recommendations for each Wildlife Management District **(WMD; Figure 1)** on an annual basis, relying on a wide variety of data sources such as harvest data, biological data collected from harvested deer, winter severity data, and observation data from citizen scientists. A hunter with an ADP may take an antlered deer anywhere in the state or an antlerless deer in a designated area.

In 2021, we distributed 153,910 ADPs among 26 WMDs and two deer management subunits to meet a statewide doe harvest objective of 15,187. Because many ADP holders choose not to harvest a doe or not to hunt, MDIFW applies an expansion factor to each WMD to ensure we issue enough ADPs to meet each district's doe removal goals. In other words, we issue more permits than the number of does we expect will be harvested. An expansion factor of 10 indicates that MDIFW estimates it will need to issue 10 permits for every adult doe harvested. In 2021, applied expansion factors ranged by WMD from 0.5 to 15. We distribute permits by lottery, and there were 91,460 permit applicants in 2021. In districts with more permits available than applicants, bonus permits may be distributed, allowing hunters to harvest an extra antlerless deer in a designated area.

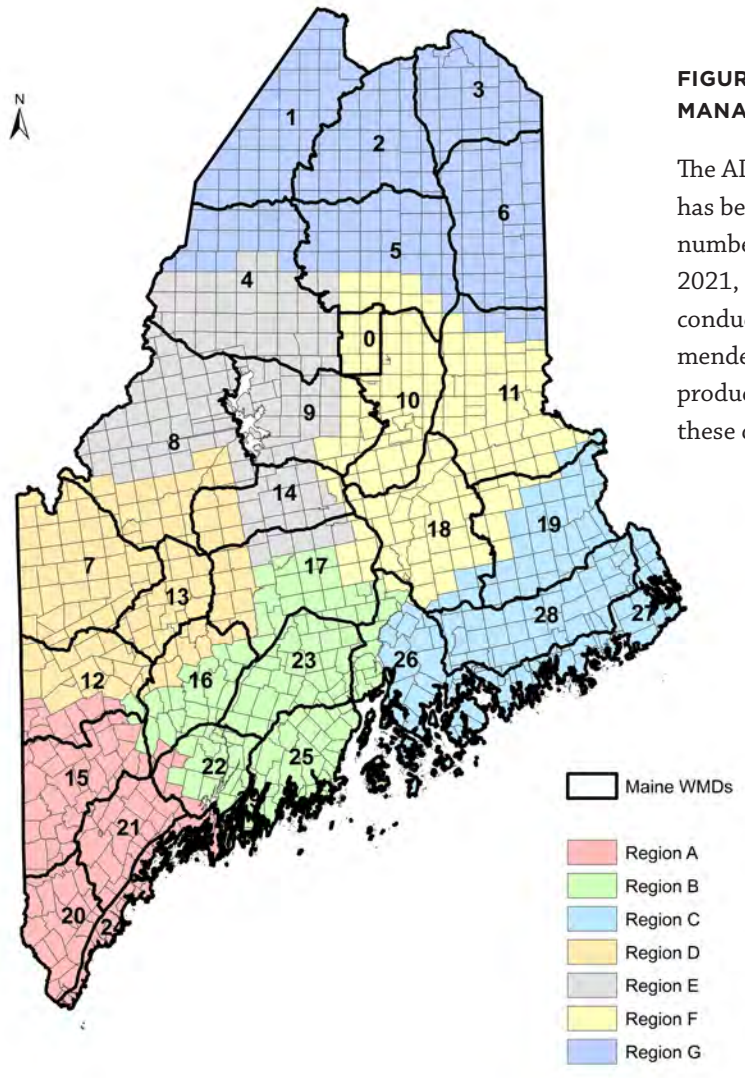


FIGURE 1. MDIFW REGIONAL AND WILDLIFE MANAGEMENT DISTRICT (WMD) BOUNDARIES.

The ADP system was developed in 1986. Since then, it has become increasingly difficult to harvest the desired number of does each year through ADPs alone. Throughout 2021, MDIFW worked with legislators and stakeholders to conduct an ADP system review and develop a list of recommended changes that would improve the system's ability to produce desired doe harvest levels. We expect to implement these changes for the 2022 deer hunting seasons.

Maine's deer hunters registered 38,947 deer during the 2021 hunting seasons *(Tables 1, 2)*. This was 5,788 more deer than 2020 — a 17.5% increase. Roughly 85% of that harvest occurred during the regular firearms season *(including Opening Saturday)*.

HARVEST STATISTICS

The statewide antlered (adult) buck harvest totaled 21,697, a 13.3% increase from 2020 **(Table 1).** The five WMDs producing the most bucks per square mile in 2021 were (in descending order) districts 22, 21, 24, 23, and 25. Overall, hunters registered 17,250 antlerless deer, 3,313 of which were male fawns, 2,871 of which were female fawns, and 11,066 of which were adult (yearling and older) does. The adult doe harvest was below the Department's objective of 15,187, following a decade-long trend of adult doe harvests averaging ~23% below objective.

♂ 2021

TABLE 1. MAINE DEER HARVEST IN 2021 BY WILDLIFE MANAGEMENT DISTRICT (WMD).

	ADULT		FAWN		TOTAL		HARVEST PER 100 ADULT BUCKS		HARVEST PER 100 SQ MILES HABITAT		
WMD	BUCK	DOE	BUCK	DOE	ANTLERLESS DEER	ALL DEER	ADULT DOES	ANTLERLESS	ADULT BUCKS	ALL	ADULT DOES
1	71	0	0	0	0	71	0	0	5	5	0
2	63	7	3	2	12	75	11	19	5	6	1
3	133	12	10	2	24	157	9	18	15	18	1
4	97	0	0	0	0	97	0	0	5	5	0
5	73	2	0	0	2	75	3	3	5	5	0
6	307	73	23	17	113	420	24	37	22	29	5
7	417	58	23	13	94	511	14	23	30	37	4
8	329	20	17	6	43	372	6	13	17	19	1
9	74	4	3	2	9	83	5	12	8	9	0
10	73	6	3	1	10	83	8	14	8	9	1
11	297	27	16	6	49	346	9	16	18	21	2
12	590	56	36	12	104	694	9	18	64	76	6
13	516	93	35	21	149	665	18	29	92	118	17
14	250	32	17	8	57	307	13	23	34	42	4
15	1,596	923	253	226	1,402	2,998	58	88	171	321	99
16	1,594	822	260	222	1,304	2,898	52	82	207	375	106
17	2,438	1,098	325	268	1,691	4,129	45	69	182	309	82
18	412	60	31	16	107	519	15	26	33	42	5
19	188	14	8	3	25	213	7	13	16	18	1
20	1,356	714	190	167	1,071	2,427	53	79	234	418	123
21	1,514	1,219	392	377	1,988	3,502	81	131	315	728	253
22	1,496	1,246	410	363	2,019	3,515	83	135	345	811	288
23	2,228	1,655	459	414	2,528	4,756	74	113	285	609	212
24	653	564	146	152	862	1,515	86	132	298	691	257
25	1,836	1,460	373	375	2,208	4,044	80	120	262	576	208
26	1,650	508	154	108	770	2,420	31	47	183	269	56
27	709	85	42	19	146	855	12	21	97	117	12
28	378	30	18	6	54	432	8	14	35	40	3
29	358	278	66	65	409	767	78	114	247	528	191
UNKNOWN	1	0	0	0	0	1	0	0	1	1	0
STATEWIDE	21,697	11,066	3,313	2,871	17,250	38,947	51	80	75	135	38

Corrections applied for errors in sex-age. Estimated error rates are applied independently for each table, so estimates will vary.

2021

TABLE 2. MAINE DEER HARVEST IN 2021 BY HUNTING SEASON.

SEASON	ADULT		FAWN		TOTAL DEER	TOTAL ANTLERLESS DEER	PERCENT BY SEASON AND WEEK		
	BUCK	DOE	BUCK	DOE			TOTAL	ADULT BUCK	ANTLERLESS
ARCHERY	1,138	1,322	311	353	3,124	1,986	8	5	11
Expanded	632	701	168	196	1,697	1,065	4	3	6
Oct	506	621	143	157	1,427	921	4	2	5
YOUTH DAY	380	421	122	120	1,043	663	3	2	4
REGULAR FIREARMS	19,435	8,744	2,734	2,264	33,177	13,742	85	90	80
Opening Sat	1,568	935	297	251	3,051	1,483	8	7	9
Nov 2 - 7	5,332	2,942	887	762	9,923	4,591	25	25	27
Nov 9 - 14	4,160	1,483	501	376	6,520	2,360	17	19	14
Nov 16 - 21	4,544	1,447	493	359	6,843	2,299	17	21	13
Nov 23 - 28	3,831	1,937	556	516	6,840	3,009	18	18	17
MUZZLELOADER	730	577	151	137	1,595	865	4	3	5
Nov 30 - Dec 5	395	247	63	57	762	367	2	2	2
Dec 7 - 12	335	330	88	80	833	498	2	1	3
UNKNOWN	5	3	0	0	8	3	0	0	0
TOTAL	21,688	11,067	3,318	2,874	38,947	17,259	100	100	100

Corrections applied for errors in sex-age. Estimated error rates are applied independently for each table, so estimates will vary.
8 records with no season recorded.

HUNTER PARTICIPATION

Each year, MDIFW sends an online deer hunter effort survey to a randomly selected group of Maine deer hunters to determine how much time they are spending hunting during the regular firearms deer season. In 2021, Maine deer hunters spent an average of 7.2 days and 4.9 hours per day hunting deer during this season. This means that the average hunter spent ~35 hours in the field pursuing deer during the firearms season, which was close to the 34 hours they spent in 2020. Distribution of effort followed a typical pattern, with high hunting effort resulting in high buck harvest **(Figure 2).** We use effort data to define one parameter in a sex-age-kill (SAK) model to estimate deer density and abundance. These data bring valuable context to discussions about deer populations and permit recommendations.

This year's survey included the following additional questions:

"Did you observe any bucks mounting (breeding) does during the regular firearms season? If so, when?"

We added this question to see if the deer hunter effort survey could provide a small amount of additional data about conception dates. Only 17 of the 718 hunters who answered the question had witnessed breeding behavior, with most of it occurring in the third week of the regular firearms season. This question will be continued in the future.

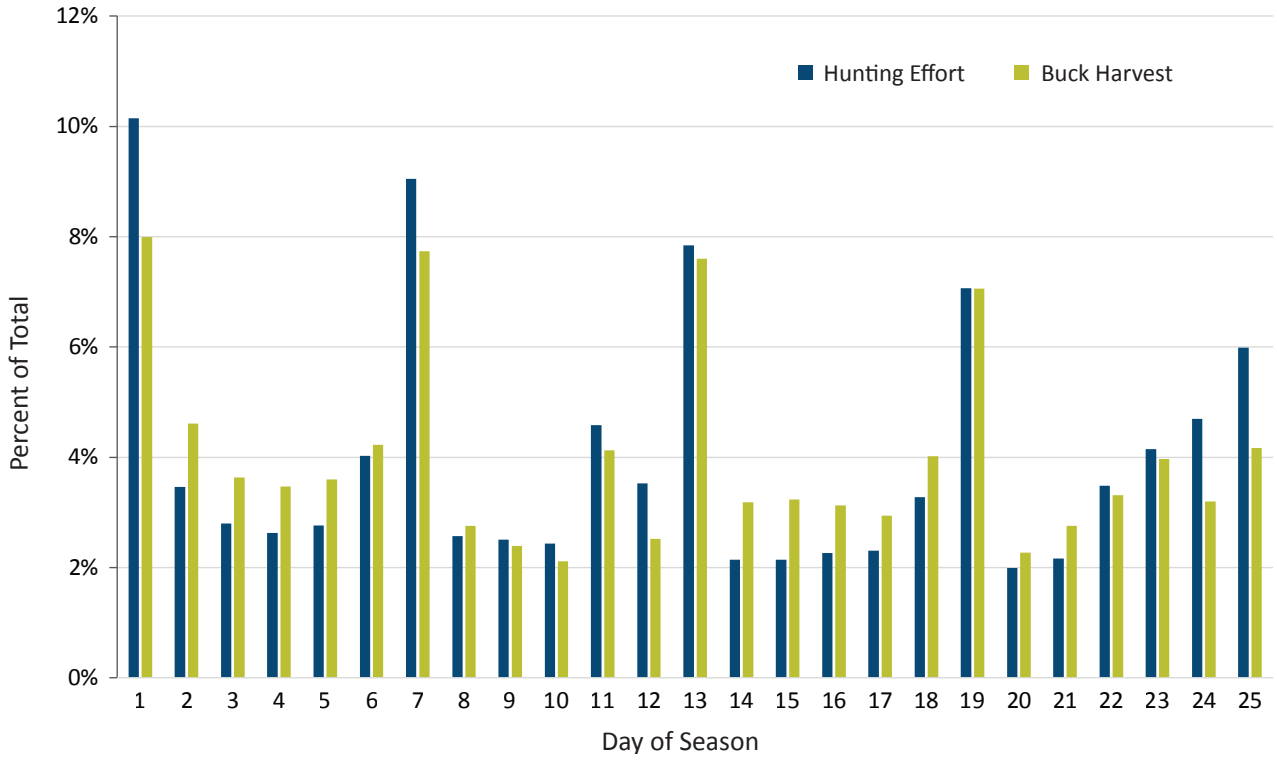
"What best describes where you stay and how you travel to your hunting sites most often during the regular firearms season?"

Roughly 50% of respondents said that they travel to hunt on land owned by somebody else and return home at the end of the day. Nearly 25% said they hunt on the same property where they live, 12% stay at a "camp" and either hunt there or travel to their hunting location from there, and 8% travel to hunt on land that they own elsewhere and return home at the end of the day. The rest of respondents voted "other."

"Did you use any of the following to hunt deer during the regular firearms season? Check all that apply."

Roughly 76% of hunters used deer calls, 50% used a scent eliminating product, 44% used a portable deer stand, 29% used a natural deer urine lure, 16% used a synthetic deer lure, 3% used a natural lure such as a tarsal gland, and less than 1% used a deer decoy.

♂ 2021 **FIGURE 2. MAINE DEER HUNTER EFFORT AND BUCK HARVEST DURING THE 2021 REGULAR FIREARMS DEER HUNTING SEASON.**



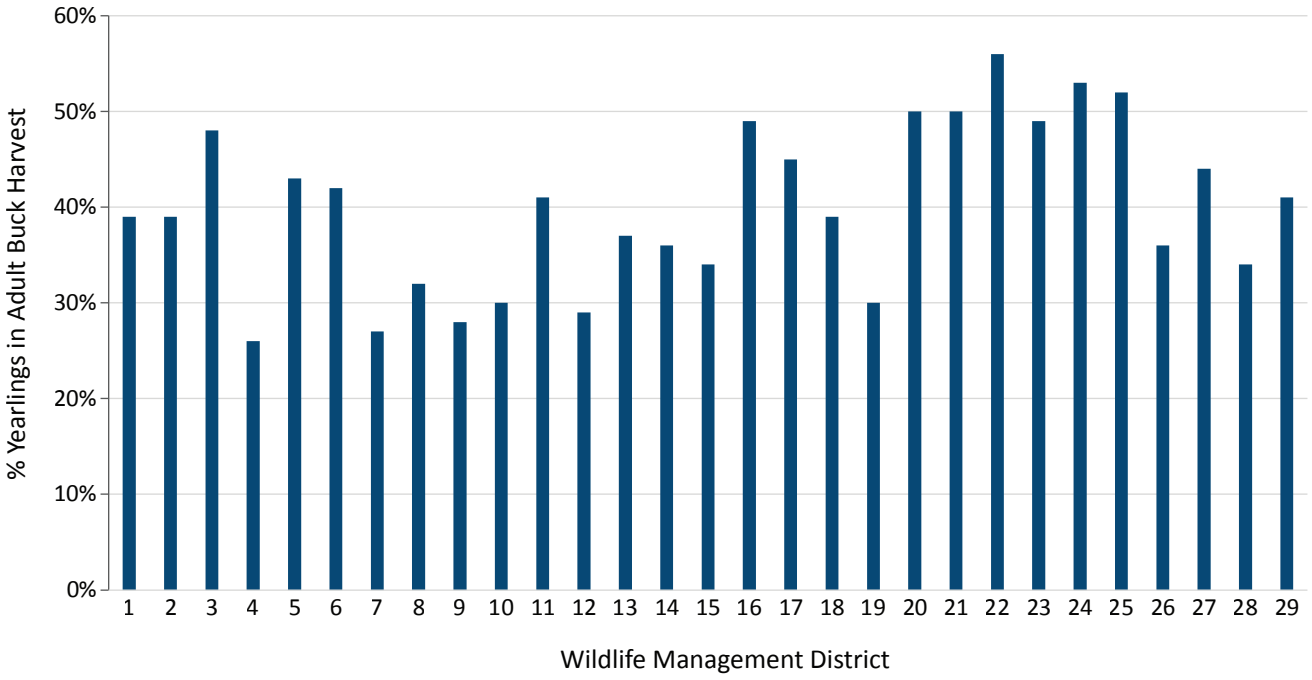
Biological Data

AGE AND SEX STRUCTURE

Age and sex structure data provide insight into mortality rates and adult sex ratios, and they are among the most important data we collect each year. To gather age structure data, trained staff examine deer harvested during the regular firearms season to differentiate between yearlings and "adults" (2+ years old). MDIFW also collects a sample of incisor teeth each year at the Regional scale **(Figure 1).** These teeth are sent to a laboratory for cementum annuli analysis, which provides insight into advanced age structure. This data may be viewed at the end of the annual deer age report on our website maine.gov/ifw/hunting-trapping/hunting/harvest-information.html.

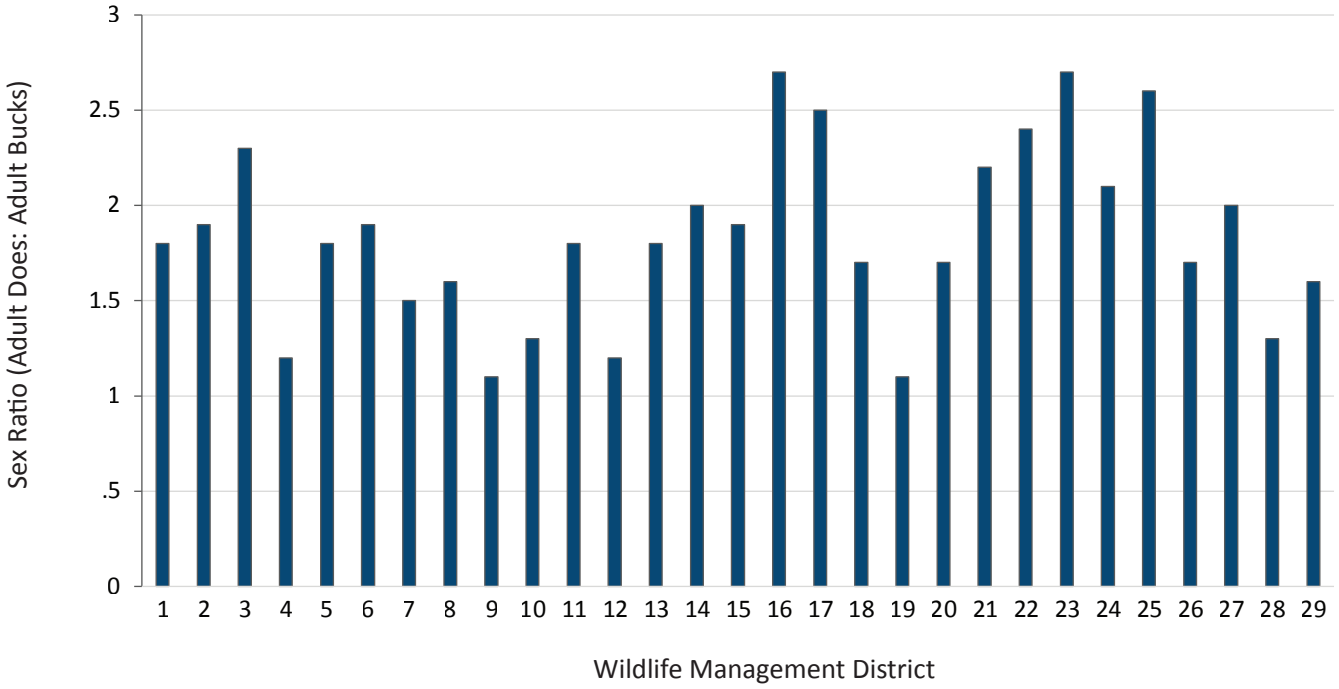
Monitoring yearling frequencies gives us a way to estimate adult sex ratios (number of adult does per adult buck; **Figure 4).** The yearling frequencies that we use in management decision making are 7-year running averages **(Figure 3).** This ensures that values track with population changes over time while avoiding high single-year variability from stochastic events such as very severe or very mild winters.

♂ 2021 **FIGURE 3. YEARLING MALE FREQUENCIES USED IN MANAGEMENT DECISION MAKING IN MAINE, 2021.**



♂ 2021

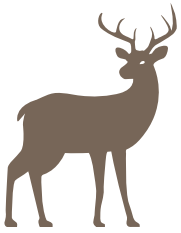
FIGURE 4. ESTIMATED ADULT SEX RATIOS (ADULT DOES PER ADULT BUCK) IN MAINE, 2021.



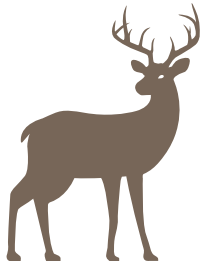
BUCK AGE STRUCTURE MANAGEMENT

MDIFW prefers that all hunters be able to choose to take the deer that best fits their hunting values and the hunting experience that they are looking for; we don't want to restrict someone's ability to take the buck they want. We recognize that a number of Maine's deer hunters want to see more older bucks, so we have begun to provide information to hunters about the benefits of voluntarily passing on young bucks.

While a Maine buck reaches its peak growth around years 6 or 7, it unlocks a lot of its growth potential between its first and second years. Our average yearling buck sports three to four antler points and has a dressed weight of 120-125 pounds. By Year Two, he has six or seven points and a dressed weight of 145-150 pounds. If managing for older, bigger bucks is appealing to you, consider allowing a young buck to pass by and grow for another year.



YEAR 1
3-4 Antler Points
120-125 Pounds



YEAR 2
6-7 Antler Points
145-150 Pounds

DEER WEIGHTS AND ANTLER CHARACTERISTICS

During annual biological data collection, MDIFW collects dressed weight and antler characteristic data. We consider yearling antler beam diameters (YABD) as an index, which tells us the deer population level relative to carrying capacity. Higher YABD measurements suggest a higher plane of nutrition and a population well below the land's carrying capacity, while lower YABD measurements suggest a lower plane of nutrition and a population closer to the land's carrying capacity. YABD measurements between 15.5 and 16.8mm are considered to be at-target. YABD values used in management decision making for 2021 ranged by WMD from 16.5 to 18.2.

The average adult Maine buck sported 7.0 points in 2021 with little variation north-to-south. The average yearling buck had 3.5 points. YABDs averaged 18.1 mm statewide with little variation north-to-south, suggesting that populations are generally below the carrying capacity of the land.

The average dressed weight for a Maine adult buck in 2021 was 154 pounds. Average weights varied by WMD north-to-south, with bucks in the northern WMDs averaging around 175 pounds and bucks in southern Maine closer to 150 pounds, though this is influenced both by latitude and age. Yearling bucks averaged 118 pounds statewide. The average dressed weight of an adult doe was 112 pounds statewide, and the average for a yearling doe was 98 pounds. Buck fawns dressed at 66 pounds on average and doe fawns 57 pounds.

RECRUITMENT

To better understand recruitment trends, a citizen science project called "Maine Deer Spy" was initiated in 2020 to collect deer observation data from Mainers with a particular interest in doe-fawn group observations. In 2021, 2,437 observations were collected from 790 different observers between August 1 and September 30. After quality control measures, which included removing data outside of the observation range, removing outliers and incorrectly entered values, and thinning data by observers, the dataset consisted of 1,968 deer group observations. Observations of single does and their fawns are particularly valuable as they provide the highest-confidence data of the number of fawns with each doe. There were 632 such observations in 2021, and the average number of fawns per doe was 1.59. Among all observed does, 53.8% had fawns with them.

After two years of data collection through Maine Deer Spy, we've been extremely pleased with the amount of interest and participation, and we plan to continue this effort into the future. As more years of data are collected, we will be able to provide additional summary statistics and trend data.

This Maine doe has successfully raised four fawns in each of the last two years. Photos submitted to Maine Deer Spy project by an anonymous photographer.

Winter Severity Monitoring

WINTER SEVERITY INDEX

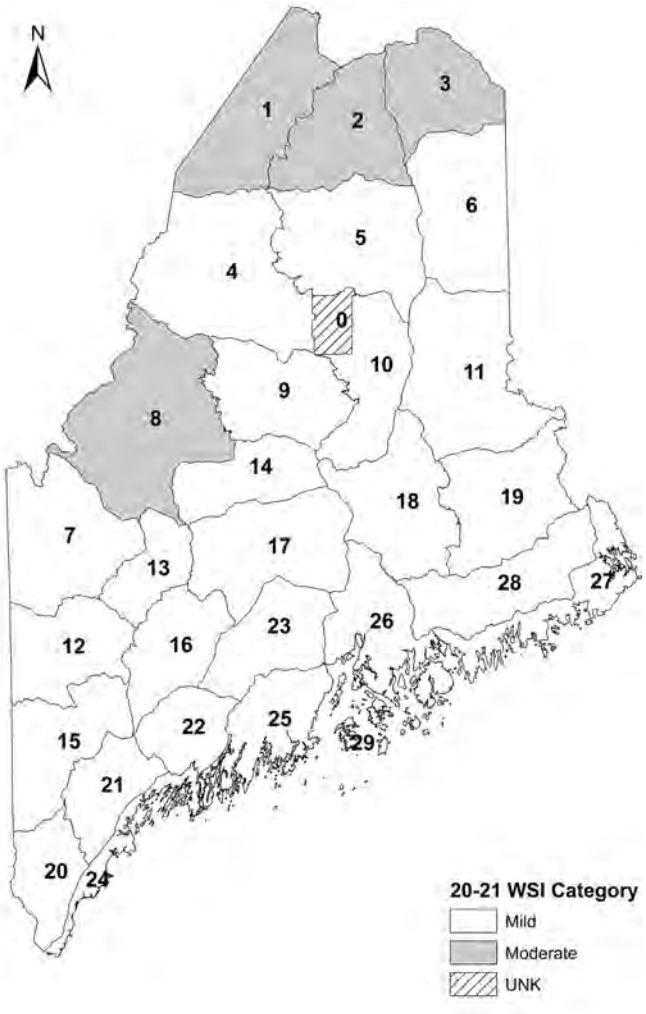
MDIFW monitors winter severity at 26 stations statewide, collecting data on snow depths, deer sinking depths, and temperature. We use these data to calculate a winter severity index (WSI) value, which we use to estimate deer winter mortality rates. These estimates play an important role in developing permit recommendations, particularly in northern Maine. The winter of 2020-2021 was a relatively mild one statewide, with WSI values below the long-term mean in all 29 WMDs. In terms of WSI rating, four WMDs experienced a "moderate" severity winter and the other 25 experienced a "mild" severity winter **(Figure 5).**

DEER COLLARING PROJECT

Since 2015, MDIFW has been capturing and GPS-collaring white-tailed deer in four study sites: WMD 1 near Allagash, WMD 5 near the Scraggly Lake Maine Public Reserved Land, WMD 6 throughout, and WMD 17 throughout. We created this study to improve our understanding of how winter severity impacts deer winter mortality rates. The results will aid MDIFW in decision making and permit allocation processes each year. Additional data on cause-specific mortality are collected as well.

Through 2021, we have collared 268 unique deer: 61 in WMD 1, 39 in WMD 5, 99 in WMD 6, and 69 in WMD 17. The winter of 2020-21 was the seventh and final capture year. The batteries on our collars typically last for 2-2.5 years, so we expect data collection to be completed or near enough to completion for final data analysis by 2023.

FIGURE 5. WINTER SEVERITY INDEX (WSI) RATINGS BY WILDLIFE MANAGEMENT DISTRICT (WMD) IN MAINE, 2021.



Health and Diseases

CHRONIC WASTING DISEASE

Chronic wasting disease (CWD) is an always-fatal brain disease that impacts cervids such as white-tailed deer, mule deer, caribou, moose, and elk. CWD has been found in wild deer populations in 29 U.S. states and three Canadian provinces, but it has not yet been found in Maine. CWD can persist in the environment outside of a host for many years, and plants can uptake the disease agent and subsequently become a potential disease vector. The nearest state or province where CWD is found in wild cervids is Pennsylvania. There is currently no evidence that CWD can or has been transferred to humans, but similar diseases in humans do exist, and the disease has been transmitted to primates in a laboratory setting.

MDIFW has monitored white-tailed deer for CWD since 1999, during which time we have screened over 12,750 wild deer. In 2021, we collected 497 samples for lab testing (494 from white-tailed deer and 3 from moose or captive cervids), and all samples tested negative. As a precaution, MDIFW does not translocate deer from other states into Maine, and we prohibit the transportation of unprocessed deer carcasses and/or parts into Maine from all states and provinces other than New Hampshire. MDIFW has drafted a response plan for CWD, which outlines steps and protocols to follow if CWD is detected in an adjacent jurisdiction or in Maine.

There are many ways that you can help prevent the introduction of CWD into Maine or limit its spread if found:

Prevent the spread: If you feed deer, keep your feeding sites small and spread out on the landscape, and rotate sites periodically. Consider using synthetic deer lures instead of natural deer urine lures. Know and follow the state laws and rules around carcass processing and movement.

Report the signs: Contact your regional wildlife biologist or warden if an animal shows clinical signs of illness, such as loss of fear of humans, excessive drooling or urinating, loss of coordination, and/or excessive weight loss.

Protect yourself: When processing a harvested deer, take precautionary steps such as using latex gloves and sterilizing your equipment afterward. Also, avoid consuming the brain and spinal tissues.

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

PFAS are human-made chemicals that are resistant to heat, water, and oil. For decades, PFAS have been used in industrial applications and consumer products such as carpeting, waterproof clothing, upholstery, food wrappings, personal care products, fire-fighting foams, and metal plating. Long-term human exposure to PFAS chemicals may negatively impact cholesterol levels, liver enzyme chemistry, and immune response, and may lead to higher incidences of certain cancers.

In November 2021, MDIFW and the Maine Center for Disease Control and Prevention (MECDC) issued a "Do Not Eat" advisory for deer taken in the greater Fairfield, Maine area. A "Do Not Eat" advisory is a recommendation to not eat game harvested within a specified area issued in response to a possible health concern. The "Do Not Eat" advisory was issued due to high levels of a PFAS chemical known as PFOS (perfluorooctane sulfonic acid) found in five of eight deer collected in Fairfield close to fields known to have high PFOS soil levels and high PFOS surface water levels. PFOS levels in meat were approximately 40 ng/g and were similar in a fawn, yearling, and adult animal. These levels of PFOS in meat were high enough to warrant a recommendation to eat less than two to three meals per year.

Additional sampling will be conducted on deer and other species in the Fairfield area and other areas of the state to inform new advisories and refine those that already exist.

A group of three Maine piebald deer in 2021. Photo by Alexander Wall.

DEER HEALTH NOTES

MDIFW collects reports of deer exhibiting signs of illness or injury as well as other unusual characteristics. If you see deer with conditions such as noteworthy hair loss, abnormal growths, behavior, or coloration, or injuries, please report these sightings and the town of observation to your nearest MDIFW regional office. Try to take and provide photos. While most cases require no management response, these reports are valuable for documenting trends and creating case histories.

MOOSE

Lee Kantar

Season Dates

2021

WMDs 1-6

Sep 27-Oct 2
Oct 11-16
Oct 25-Oct 30

WMDs 4a

Oct 18-24
Oct 25-Oct 30
Nov 1-6

WMDs 15-16

Nov 2-Nov 28

2020

WMDs 1-6

Sep 28-Oct 3
Oct 12-17
Oct 26-Oct 31

WMDs 15-16

Nov 2-Nov 27

Statistics

2021

2,607 moose were registered

2020

2,366 moose were registered

2021 Moose Harvest

SEASON DATES AND STRUCTURE

The 2021 season framework allowed moose hunters to hunt for six days in September, October, and/or November.

Moose Permits and Applicants

TOTAL MOOSE PERMITS

The annual allocation of moose hunting permits is developed in relation to the Big Game Management Plan (BGMP) for moose. Permit levels changed in eight WMDs from 2020 to 2021, resulting in an increase of 345 permits issued statewide (3,480 total). In WMD 4a, another 550 antlerless permits were allocated for the Adaptive Hunt, bringing the grand total to 4,030. Permit changes reflect the implementation of the BGMP, which increases cow permits in the core range to promote a healthier moose population, opens additional WMDs during the September season, and increases bull hunting opportunity in the northwest portion of the core range.

MDIFW allocates moose hunting permits to qualified applicants through a random computerized lottery and may issue additional permits to prior-year permittees who deferred a year due to illness, military service, or similar situations.

ANTLERLESS-ONLY PERMITS (AOPS)

In 2021, a total of 1,360 Antlerless Only Permits (AOPs) were allotted to seven WMDs (1-6 and 8, including 4a).

Moose health is directly tied to the productivity of cows. That is, a healthier moose population has heavier cows that reproduce at an earlier age, reproduce more frequently, and have a higher probability of calving twins. Moose populations that exist at lower densities tend to have higher productivity rates. Over the last 30 years, moose productivity in Maine has declined.

ANY-MOOSE PERMITS (AMPS)

Any-moose Permits (AMPs; Bull, cow or calf) are allocated in areas of southern Maine where moose densities are lower and allow for a small harvest. To honor Southern Maine landowners' recommendations, this season coincides with the November firearms season for deer.

Statewide Statistics for 2021

2,608 moose were registered in 2021 **(Table 1)**.

2021

TABLE 1. 2021 MAINE MOOSE SEASON REGISTERED KILL BY WILDLIFE MANAGEMENT DISTRICT (WMD), SEASON, AND PERMIT TYPE. THE PERCENTAGE OF HUNTERS SUCCESSFULLY HARVESTING A MOOSE ARE GIVEN BY SEASON FOR EACH WMD.

2021 Maine moose season registered kill by WMD, season, permit type, and success rates.

				2021 REGISTRATIONS	
WMD	SEASON	PERMIT TYPE	# OF PERMITS	KILL	SUCCESS RATE
1	SEP	BOP	225	171	76%
	OCT	BOP	225	123	55%
	2nd OCT	AOP	175	159	91%
	*WMD Subtotals		625	453	72%
2	SEP	BOP	175	126	72%
	OCT	BOP	175	84	48%
	2nd OCT	AOP	175	137	78%
	*WMD Subtotals		525	347	66%
3	SEP	BOP	100	71	71%
	OCT	BOP	100	73	73%
	2nd OCT	AOP	125	95	76%
	*WMD Subtotals		325	239	74%
4	SEP	BOP	200	153	77%
	OCT	BOP	200	82	41%
	2nd OCT	AOP	100	63	63%
	*WMD Subtotals		500	298	60%
4a	SEP	AOP	169	96	57%
	OCT	AOP	143	84	59%
	2nd OCT	AOP	177	73	41%
	*WMD Subtotals		489	254	52%
5	SEP	BOP	125	106	85%
	OCT	BOP	125	83	66%
	2nd OCT	AOP	125	94	75%
	*WMD Subtotals		375	283	75%
6	SEP	BOP	100	83	83%
	OCT	BOP	100	51	51%
	2nd OCT	AOP	60	48	80%
	*WMD Subtotals		260	182	70%
7	OCT	BOP	125	75	60%
	*WMD Subtotals		125	75	60%
8	OCT	BOP	200	134	67%
	2nd OCT	AOP	50	46	92%
9	OCT	BOP	125	76	61%
	*WMD Subtotals		125	76	61%
10	SEP	BOP	30	24	80%
	OCT	BOP	30	20	67%
	*WMD Subtotals		60	44	73%
11	SEP	BOP	25	22	88%
	OCT	BOP	25	12	48%
	*WMD Subtotals		50	34	68%
12	OCT	BOP	25	16	64%
	*WMD Subtotals		25	16	64%
13	OCT	BOP	15	7	47%
	*WMD Subtotals		15	7	47%
14	OCT	BOP	30	19	63%
	WMD Subtotals		30	19	63%
15	NOV	AMP-B		4	NA
	NOV	AMP-C		2	NA
	WMD Subtotals		25	6	24%
16	NOV	AMP-B		0	NA
	NOV	AMP-C		3	NA
	WMD Subtotals		15	3	20%
17	OCT	BOP	10	4	40%
	WMD Subtotals		10	4	40%
18	SEP	BOP	20	14	70%
	OCT	BOP	20	10	50%
	*WMD Subtotals		40	24	60%
19	SEP	BOP	30	23	77%
	OCT	BOP	30	15	50%
	*WMD Subtotals		60	38	63%
27/28	SEP	BOP	20	16	80%
	OCT	BOP	20	11	55%
	WMD Subtotals		40	27	68%
TRADITIONAL WMD TOTALS			3,480	2,355	68%
PLUS ADAPTIVE			3,969	2,607	66%

BOP = Bull Only Permit – The holder may kill one male moose of any age.

AOP = The holder may kill a cow or a calf (male or female); by definition an antlerless moose is a moose without antlers.

AMP = Any Moose Permit – The holder may kill any moose.

**Does not include additions to total permit allocation through deferment, hunt of a lifetime, and auction.*

2021 Bull Harvest

TOTAL HARVEST, AGE DISTRIBUTION

Among the 1,718 antlered bulls killed during the Sep/Oct 2021 season (totaling 81 less than the 2020 harvest of 1,799), biologists aged 1,363 of them by counting the cementum annuli on a canine tooth extracted from the animal.

Ages were distributed as follows:

- 1½ years old (yearlings sporting their first set of antlers): 6% (76)
- 2½ years old: 23% (319)
- 3½ years old: 17% (233)
- Mature bulls (aged at 4½ to 15½ years): 54% (735)

AVERAGE WEIGHT

On average, breeding bulls lose approximately 15% of their body mass during the rut (September to October). In 2021, this translated to a 9% decrease in average dressed weights from the September to October seasons (707 in Sept. vs. 645 in Oct).

RECORD WEIGHT

The heaviest bull weighed in at 1,038 lbs. field dressed (no digestive tract, heart, lungs, or liver). He was 7½ years old and was killed in WMD 5 during the September season.

RECORD ANTLER SPREAD

The largest antler spread was 65 inches with 20 legal points.

ANTLER STATS

Of the antlered bulls, 13% sported cervicorn antlers (antlers without a defined palm), 30% were yearlings, and 11% were mature bulls (>4 years old). The oldest was 12½ years old.

Antlerless Harvest

TOTAL HARVEST

The 2021 statewide harvest of adult (yearling and older) cows was 809 (up from 565 in 2020). In addition, 81 calves (48 males and 33 females) were harvested for a total harvest of 890 antlerless moose, including those taken as part of the AMPs issued within the southern zones and the Adaptive Hunt.

MOOSE REPRODUCTIVE DATA

Antlerless permits during the second October season allow MDIFW to collect reproductive data critical to assessing and monitoring moose population health and growth. In 2021, hunters in WMDs 1-6 and 8 removed and brought in 163 sets of moose ovaries for examination by biological staff.

Typically, a cow moose will not become pregnant until 2½ years old. The number of offspring she will produce depends upon her body weight and condition – factors influenced strongly by diseases and parasites such as the winter tick. Of the cow moose examined in 2021, 90% of those older than 2½ years were pregnant.

MDIFW biologists can forecast a cow's reproduction rates (number of calves being born to a cow) by looking at corpora lutea, which are identifiable structures within the ovaries that indicate ovulation and potential pregnancy rates. Overall, there were 0.96 corpora lutea per cow for cows older than 3½ years (maturity).

This is an **increase** from 2020, yet still represents depressed reproductive rates. We continue to evaluate the role of winter ticks and their impact on moose fitness, including their role in depressed reproductive rates.

Hunter Participation, Residency, & Success Rate

In 2021, 3,548 residents, 314 nonresidents, and 62 lodge owners won permits to hunt moose. Most nonresidents were successful in their hunt (88% success rate). Out-of-state hunters came from 39 states (as far away as Alaska). The majority (12%) of out-of- state hunters came up from Massachusetts.

Resident success rates were 64% and when combined with the outstanding success by out-of-staters equaled 66%. The higher success rate of out-of-state hunters, as compared to residents, may be attributed to the higher proportion of out-of-state hunters using registered Maine guides for their hunt. Success rates over the last 10 years have been around 80%.

Conditions for September and October were highly variable with September starting out extremely warm; unseasonable warm conditions typically lead to lower success rates.

In 2022, there will be four separate "traditional" moose hunting periods in Maine.

- The September season will run from Sep 26–Oct 1 in WMDs 1-6, 10, 11, 18, 19, and 27/28.
- The October season will run from Oct 10-15 in WMDs 1-14, 17-19, and 27/28.
- In WMDs 15 and 16, the season will coincide with November's deer season, which runs from Oct 31 through Nov 26. Opening day for Mainers will be on Saturday, Oct 29.
- WMDs 1-6 and 8 will have a cow moose hunt from Oct 24-Oct 29.

Moose hunters who have a permit to hunt WMD 27 or WMD 28 can hunt in either WMD.

In addition, there will be 3 additional moose hunt weeks as part of the Adaptive Moose Hunt Unit (see below), these weeks will run consecutively starting Oct 17-22, Oct 24-29, and Oct 31-Nov 5.

Comprehensive Moose Management in Maine

The Department has conducted aerial surveys to estimate moose abundance and composition (bull, cow, and calf) across Maine's core range of moose (roughly a line from Grafton Notch to Calais) since 2011. Aerial survey data combined with reproduction (ovaries-corpora lutea) and age data from moose teeth (from harvest) provides biologists with a more complete picture of Maine's moose population size and composition than ever before. Biologists and the Commissioner's Advisory Council (rulemaking body), use these data to align moose permit levels with publicly derived management goals including moose viewing and hunting (both weighed equally).

Moose Adult Cow and Calf Survival Study

The size of Maine's moose population is not static, and fluctuates in response to many factors, especially calf birth and overwintering calf survival rates. The winter of 2019-2020 signified the last aerial capture and GPS collaring of calves (~8 months old) in WMDs 2 and 8. This was the final round in our study of Adult Cow and Calf survival after seven years of intensive work. The study examined calf and adult survival rates and causes of mortality.

The study began in the winter of 2014 in WMD 8 and in 2016 a second study area in northern Maine (WMD 2) was added. Since 2014, we have captured over 675 moose and fitted them with GPS collars. These collars enable us to track moose locations and movements over time, and to be notified via text/email message if a moose dies.

During the course of our work in WMD 8 and 2 we observed adult cows each spring and summer to determine reproduction rates and survival of calves; for each collared moose, we collect detailed health information, including an assessment of blood parameters, parasite loads, body condition, and winter tick loads. This information is providing our researchers with a comprehensive look at moose health, including the impact of parasites on survival and reproduction.

Adaptive Management Unit

This past winter we fit an additional 70 calves (~8-month-old) with GPS collars in WMD 4 to compare calf survival with the work in WMD 2 and 8. This unit will be monitored for the coming years to assess winter tick impacts on calves there first winter and cow reproductive rates. After public consultation the Department has begun implementing the Adaptive Unit Hunt in western half of WMD 4 to decrease the local moose population and determine if it can lessen the impacts of winter tick on overwintering calf mortality while improving reproductive success of cows.

This work is supported by the federal Pittman-Robertson program, state revenues from the sales of hunting licenses, and volunteer assistance.

BLACK BEAR

Jennifer Vashon

The Maine black bear is an iconic symbol of Maine's forests and one of our wildlife success stories. Once relegated to no more than a nuisance, the black bear has risen in stature to one of our state's most valued animals – by wildlife watchers and hunters alike.

Today, Maine's expansive northern, eastern, and western forest supports one of the largest black bear populations in the lower 48 states **(Figure 1).** MDIFW strives to balance its biological and social needs by basing management decisions on the bear monitoring, harvest, and conflict data we gather.

Monitoring

MDIFW's black bear monitoring program is one of the most extensive and longest-running programs of its type in the U.S. Over the last 46 years, Department biologists have captured and tracked more than 4,000 bears to determine their health and condition, estimate how many cubs are born each year, and determine annual cause-specific mortality rates.

Population Management

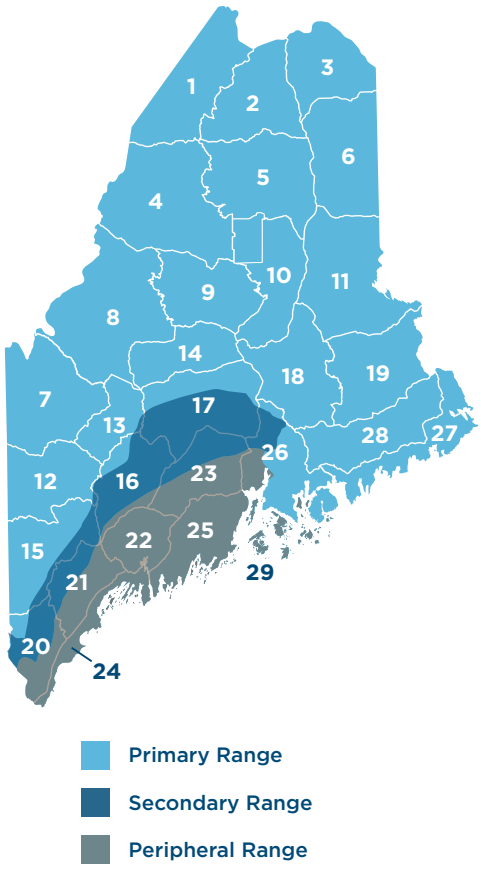
In 2017, the Department completed a 10-year black bear management plan that set a goal of maintaining a healthy, sustainable bear population overall, while minimizing population growth in areas of higher human density. To maintain the bear population at a healthy and socially acceptable level, the Department's primary tool is hunting.

Maine offers a variety of traditional bear hunting methods, but the odds of taking a bear are low. Most bears (~95%) are harvested with bait, trained bear dogs, or traps; but hunters also have the option of still-hunting or stalking, including the opportunity to take a bear while hunting deer. Success rates are just 26% for hunters using bait or trained bear dogs, <20% for trappers, and <3% for those who still-hunt or stalk bear through Maine's dense forests.

Bear Management 2017-2027

MDIFW biologists set management goals through a strategic planning process which includes public input. In 2017, we finalized a new 10-year management plan for Maine's big game species (deer, moose, bear, and turkey). This plan carefully considers black bears' value to outdoor enthusiasts and the general public, as well as the likely public acceptance of an increasing bear population. It includes goals, objectives, and a series of management strategies designed to ensure continued enjoyment of black bears without too many conflicts in backyards and neighborhoods.

FIGURE 1. MAINE BLACK BEAR RANGE



Living with Black Bears

Maine's bear population is one of the largest in the country, thriving in the forests that cover more than 90% of our state's land area.

Despite a large bear population, the number of human-black bear conflicts in Maine is lower than other northeastern states, averaging about 500 complaints each year. This relatively low conflict level is partially attributed to bears being more common where human densities are lowest. But if Maine's bear population continues to grow and expand into areas with higher human densities, conflicts could rise.

These conflicts, when they happen, tend to be mild in nature (the most common complaints we receive involve bears feeding at bird feeders and on garbage); but, if you live in a community that is experiencing these issues, they can be a great concern.

WHEN & WHY CONFLICTS HAPPEN

Most human-bear conflicts occur in the spring and early summer, after bears emerge from their winter dens and find it difficult to locate high-quality natural foods. As they search, they sometimes encounter food odors (bird seed, garbage, compost, and grills) that attract them to backyards and neighborhoods. Once berries begin to ripen in late summer, bears typically return to wooded areas to forage and conflicts with humans decline. However, when these natural foods are not abundant, bears are more likely to continue searching for food provided by people.

SOLUTIONS

Many people expect the Department to move bears that are frequenting backyards, communities, and agricultural areas because it provides a quick fix to a problem. While this can provide a temporary solution, trapping and moving a bear is not always appropriate or effective. Bears that are trapped and transferred to a new area do not stay where they are released, and they often return or create a new problem somewhere else. Moving bears also puts them at a greater mortality risk as they encounter more roads, other bears, and people.

Although it may seem simple to move or destroy the offending bear, the best solution is to remove or secure food, food odors, and other common bear attractants from your outdoor space every spring. If you don't, bears will likely continue visiting. Even when bears are trapped and transferred to new areas, you should remove or secure attractants to avoid future problems. Here is a checklist that you can run through every spring:

YOU CAN PREVENT BEAR CONFLICTS
by simply removing or securing bear attractants each spring.

	1 REMOVE & STORE INSIDE Between Apr 1 and Nov 1	2 SECURE & CLEAN
BIRD SEED 	• Take bird feeders down • Store seed and feeders indoors (you can still feed birds in the winter)	• Rake up bird seed from the ground
GARBAGE 	• Store garbage cans in a building or electric-fence enclosure • Take to curb on morning of pickup	• Keep outbuilding and garage doors closed at all times and repair broken window and doors • Keep dumpster lids and doors closed and latched • Use bear-resistant dumpsters or garbage cans
GRILLS 	• Store grill inside when not in use • If you are having bear conflicts, stop grilling until bear moves on	• Burn off food residue • Dispose of food wrappers and grease cups
PETS AND LIVESTOCK 	• Feed pets inside • Store livestock and pet food inside • Keep livestock in buildings at night • Install and maintain effective livestock fencing	If you feed your pets or livestock outside: • Clean dishes daily • Remove leftover food daily

We have revised our website and other outreach materials to provide additional information on what to do if you encounter a bear in your backyard, in your neighborhood, or during any outdoor activity in Maine. You can find that information, including printable/shareable PDFs, at: **mefishwildlife.com/livingwithblackbears.**

Black Bear Hunting and Trapping

SEASONS & PERMITS

MDIFW's management of Maine's black bears includes setting the season length, bag limit, and legal methods of hunting. In addition to a hunting license, hunters (except for resident deer hunters during the firearm season) must purchase a bear permit to hunt black bears, and each successful hunter must register their bear. The Department uses bear registration data to monitor harvest levels and adjust regulations as needed to meet bear harvest objectives.

The black bear hunting season opens the last Monday in August and closes the last Saturday in November and is restricted to certain hunting methods during certain weeks.

In 2020, hunting over bait was permitted from August 29 through September 26. The hound (trained bear dogs) season overlaps with the last two weeks of the bait season, spanning September 14 to October 30. Annually, the trapping season opens on September 1 and closes October 31 and hunters can hunt bears near natural food sources or by still-hunting throughout the entire three-month season.

Since 2011, properly licensed individuals have been allowed to harvest two bears a year if one is taken by hunting and the other by trapping. While only a small proportion of hunters and trappers take advantage of this opportunity, the number of individuals harvesting two bears increased incrementally each year to 24 hunters by 2015 then stabilized. However, in 2020 the number of hunters harvesting two bears nearly doubled to 41 hunters. In 2021, 44 hunters harvested two bears – more than any previous year.

Starting in 2015, the Saturday prior to the opening day of the season is designated for youth hunters. Although the 2021 youth day harvest (51) did not exceed the 2018 record of 64 bears, the 2021 youth day harvest was higher than average.

ANNUAL HARVEST

Although many factors, including weather and hunter numbers, influence the black bear harvest, natural food levels play a significant role. Natural foods generally alternate in abundance from one year to the next. In a good food year, bears show less interest in bait sites and forage for plentiful natural foods through late fall. In a poor food year, bears show greater interest in bait and enter their winter dens early to conserve their limited fat reserves.

As a result, harvest with the use of bait is typically higher in poor food years and lower in good food years, while harvest by deer hunters during the November firearm season is typically lower in poor food years and higher in good food years **(Figure 2 and Figure 3).**

We expected 2021 to be a good natural food year, leading to a lower bait-hunter (and therefore, lower overall) harvest. However, despite a relatively good natural food level, the 2021 harvest (3,779 bears) was similar to 2020's near-record harvest of 3,883 bears. We attribute this to an increased interest in outdoor pursuits that began during the pandemic and has continued to date. In 2021, nearly 12,500 hunters pursued bears (up 300 from 2020 and 1,500 above average) **(Table 1, Figure 3).**

FIGURE 2. HARVEST ALTERNATES WITH NATURAL FOODS. IN POOR FOOD YEARS, HARVEST BY BEAR HUNTERS USING BAIT IS HIGH AND HARVEST OF BEARS BY DEER HUNTERS IS LOW. TYPICALLY, A GOOD FOOD YEAR IS FOLLOWED BY A POOR FOOD YEAR.

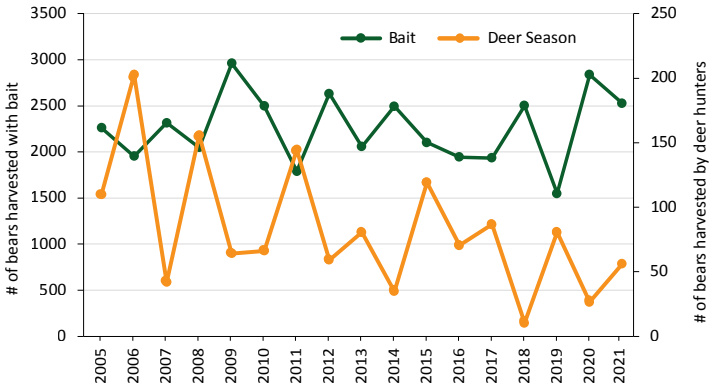
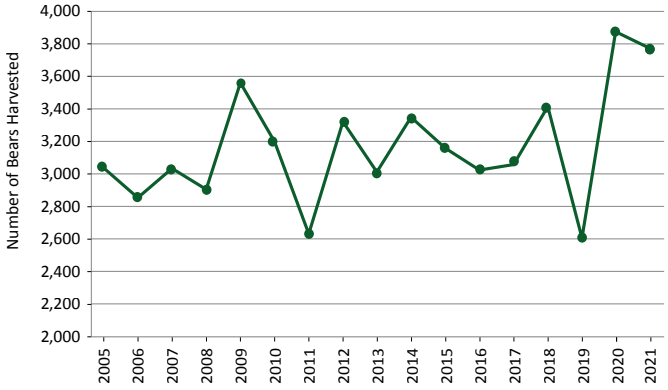
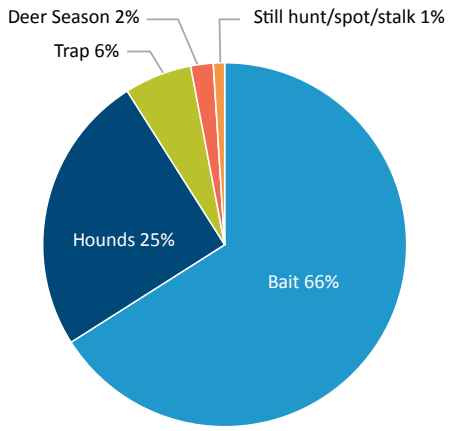


FIGURE 3. HARVEST GENERALLY ALTERNATES FROM YEAR TO YEAR IN RESPONSE TO NATURAL FOOD ABUNDANCE.



During the 2021 season, although 2,510 bears (67% of the total harvest) were taken by hunters using bait, the harvest by hunters using trained dogs reached a record high of 929, accounting for 25% of the total; and harvest by trappers also reached a record high of 239 – double the annual average. Meanwhile, harvest of bears by deer hunters in November remained low at just 57. **(Table 1 and Figure 4).**

FIGURE 4. MOST BEARS IN MAINE CONTINUE TO BE HARVESTED WITH BAIT AND HOUNDS (TRAINED BEAR DOGS). DUE TO THE LACK OF NATURAL FOODS DURING THE 2020 SEASON, FEWER BEARS WERE HARVESTED LATER IN THE SEASON BY DEER HUNTERS.



In Maine, most bears (>90%) are harvested over bait or with trained bear dogs. Prior to 2012, approximately 80% of bears were harvested over bait and 10% by hunters using dogs. Since 2013, bait has remained the prominent method of harvest, but a higher proportion of bears (16-25%) have been harvested every year using trained bear dogs. This increase is likely in response to greater interest following a recent bear hunting referendum that, if passed, would have made hunting bears with bait, trained bear dogs, or traps illegal in Maine. We saw a similar increased interest in harvesting a bear with a trap following both the 2004 and 2014 bear referendums **(Figure 5)**. It is important to note that the low number of trappers that harvested a black bear during the 2018 season was due to an emergency rule that limited the types of traps that could be set for bears during the 2018 season and not a change in interest.

Hunters that use bait or trained bear dogs have the most success, with a 30% average success rate since 2008. Success is also higher among nonresidents **(Figure 6),** who are more likely than residents to hire licensed professional Maine hunting guides (40% of nonresidents use a guide vs. 25% of residents).

FIGURE 5. HARVEST BY HUNTING USING HOUNDS (TRAINED BEAR DOGS) HAS BEEN INCREASING IN RECENT YEARS, WHERE PERIODS OF HIGH HARVEST BY TRAPPERS OCCURRED FOLLOWING THE 2004 AND 2014 BEAR REFERENDUMS, THAT IF PASSED, WOULD HAVE MADE IT ILLEGAL TO HARVEST BEARS WITH BAIT, TRAINED BEAR DOGS, OR TRAPS.

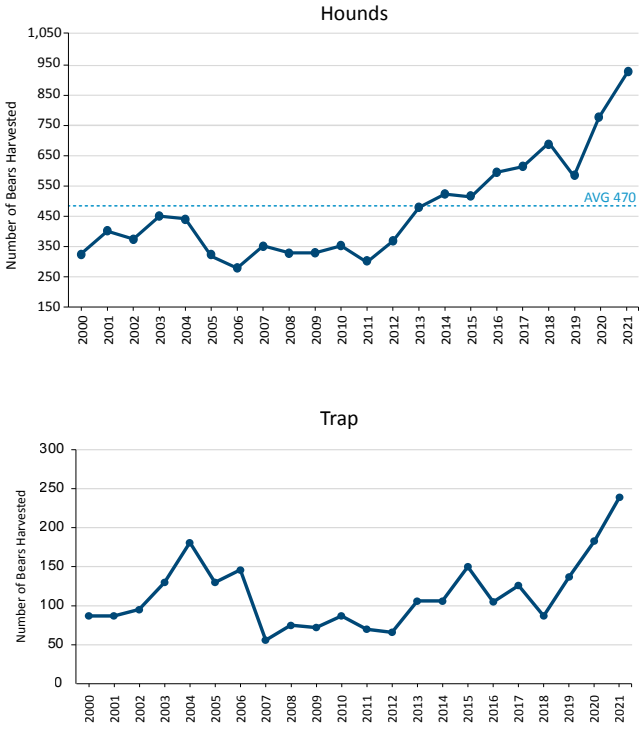
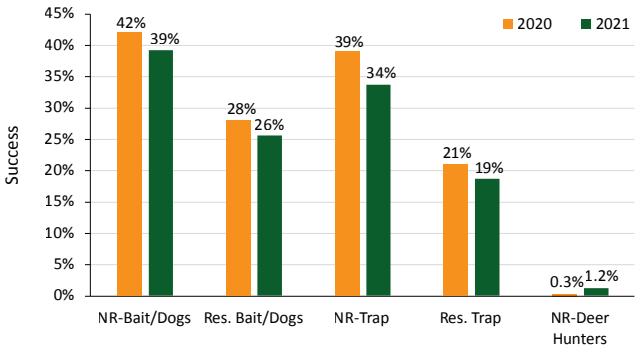


FIGURE 6. BEAR HUNTING SUCCESS RATES BASED ON PERMIT SALES BY RESIDENCE AND METHOD OF HARVEST.



2021

TABLE 1. NUMBER OF BEARS HARVESTED IN MAINE IN 2021 BY WILDLIFE MANAGEMENT DISTRICT (WMD).

	METHOD OF TAKE										
WMD	HUNTING WITH BAIT	WHILE DEER HUNTING	HUNTING WITH DOGS	SPOT AND STALK	TRAPPING	UNKNOWN[1]	TOTAL HARVEST	ARCHERY[2]	ASSISTED BY GUIDE	RESIDENT	NONRESIDENT
1	105	0	28	0	4		137	10	126	29	108
2	110	3	41	2	1		157	7	144	23	134
3	212	5	20	2	11		250	19	188	82	170
4	169	2	17	1	4		193	9	120	96	97
5	116	3	51	0	4		174	6	158	27	147
6	237	4	47	7	10		305	15	208	94	211
7	136	0	44	0	18		198	12	144	57	141
8	205	0	109	2	31		347	9	247	140	207
9	106	0	41	2	4		153	6	107	70	85
10	102	0	1	3	10		116	6	80	39	77
11	216	1	82	2	20		321	16	246	94	227
12	91	9	113	2	18		233	20	123	128	108
13	27	3	10	2	7		49	2	19	26	23
14	71	1	38	0	14		124	5	79	62	62
15	33	6	26	2	12		79	1	18	59	20
16	10	5	0	0	4		19	1	0	18	1
17	36	6	10	0	13		65	4	19	50	15
18	178	3	55	0	18		254	9	157	115	139
19	107	0	86	0	5		198	7	177	39	159
20	4	2	3	2	4		15	2	2	13	2
21	1	0	0	0	1		2	0	0	2	0
22	0	0	0	0	0		0	0	0	0	0
23	2	0	0	0	2		4	1	0	4	0
24	0	0	0	0	0		0	0	0	0	0
25	1	0	2	0	0		3	0	0	2	1
26	36	1	1	1	12		51	4	8	44	7
27	36	1	25	2	8		72	5	28	47	25
28	163	2	78	1	4		248	10	174	87	164
29	0	0	1	0	0		1	0	0	1	0
UNREPORTED							11	10	11		
STATEWIDE	2510	57	929	33	239	0	3779	196	2583	1448	2330

[1]Unknown Method = Hunter did not report the method they used to harvest their bear.

[2]This does not include 95 bears harvested with a crossbow.

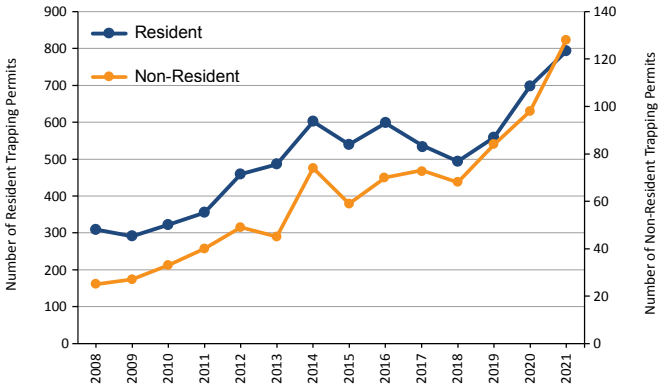
BEAR TRAPPING

Trappers can harvest a bear in September or October using a cable foot restraint or a cage-style trap. Since 2008, trappers have been required to purchase a separate permit to trap a bear, and permit sales indicate rising interest. Notably, about 90% of bear trapping permits are purchased by Maine residents.

For two years in a row, trapping permit sales reached a record high, likely in response to the pandemic and increased participation in outdoor activities **(Figure 7).** Trappers purchased 796 permits in 2020 and 919 in 2021. The prior record was set in 2014 at 676. Trapping interest spiked that year in response to a ballot initiative that, if it had passed, would have eliminated traps, bait, and trained bear dogs as legal harvest methods.

The 2020 and 2021 season harvest of 183 and 239 bears by 796 and 919 trappers eclipsed the previous five years, where an average of 538 trappers harvested anywhere between 87 and 150 bears.

FIGURE 7. THE NUMBER OF RESIDENTS AND NONRESIDENTS PURCHASING A PERMIT TO TRAP BLACK BEARS IN MAINE HAS BEEN INCREASING.



RESIDENT VS. NONRESIDENT HARVEST NUMBERS

Nonresidents harvested most of the bears during the 2021 season (62%), taking 66% of the bears with trained bear dogs and 65% of the bears taken over bait. While the percentage of the harvest by nonresident hunters using spot and stalk methods remains low, it accounted for 21% of the 2021 nonresident harvest.

Among residents, hunting over bait remains popular, with 60% of successful residents taking bears by this means. Although fewer bears are taken during the deer season, in traps, or by spot and stalk methods, Maine residents continue to account for the majority of this harvest (79%).

THE INFLUENCE OF MAINE GUIDES

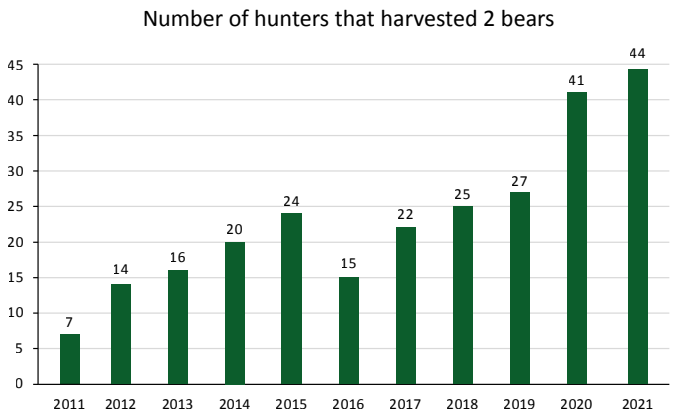
Every year, most bears harvested in Maine are taken by hunters employing a registered professional Maine hunting guide. In 2021, guides helped hunters (84% of whom were non-residents) harvest more than 2,500 bears (68% of the harvest). Hunters employing guides accounted for 83% of bears harvested with trained bear dogs, 70% of those taken over bait, and 20% of the bears taken in traps. Guides also appear to have boosted spot and stalk success, as the proportion of bears taken by spot and stalk methods with a Maine Guide also increased in the last five years, from 3% in 2016 to 18% in 2017, 21% in 2018, 12% in 2019 and 2020 and 24% in 2021.

Still, only 29% of Maine residents who harvested a bear in 2021 used a guide. Non-residents' greater use of professional Maine hunting guides could explain their overall higher success rates leading up to deer firearm season (39% compared to 26% for Maine residents).

GEOGRAPHIC DISTRIBUTION OF THE HARVEST

For the second year in a row, bears were harvested in nearly every county and WMD (14 of 16 counties and 27 of 29 WMDs). Although most bears were harvested from Aroostook County (1,103, accounting for 29% of total harvest), the density of harvest expressed as the number of bears killed per 100 square miles of habitat (forested land) was greatest in WMD 28 at 35 bears/100mi^2, followed by WMDs 3, 6, and 12 (portions of Aroostook, Oxford, Washington and Hancock counties) at between 25 and 30 bears/100 mi^2. Fewer bears were taken in southern and central portions of the state (Androscoggin, Cumberland, Kennebec, Knox and Waldo counties), and no bears were taken in Lincoln and Sagadahoc counties or WMDs 22 and 24 **(Table 1).** The statewide average of 11 bears/100 mi^2 was similar to the statewide average of 13 bears/100 mi^2 in 2020 (a poor food year) and above the statewide average of nine bears/100mi^2 in 2019 (a good food year).

FIGURE 8. THE NUMBER OF HUNTERS THAT HARVEST TWO BEARS IS LIKELY LIMITED BY THE FACT THAT ONE MUST BE TAKEN IN A TRAP. SINCE THE BAG LIMIT INCREASE IN 2011, AN AVERAGE OF 19 HUNTERS HAVE HARVESTED TWO BEARS IN A YEAR.



HUNTER PARTICIPATION

Since 1990, hunters interested in harvesting a black bear have had to purchase a bear hunting permit in addition to their hunting license. That first year, nearly 12,000 permits were sold then stabilized to approximately 10,500 permits through 1999 before rising to more than 15,000 permits by 2002. In 2003, permit fees were raised from $5 to $25 for residents and from $25 to $67 for nonresidents. Subsequently, bear hunting participation steeply dropped for residents and nonresidents alike. After a slight bump during the bear hunting referendum of 2004, numbers continued a steady decline before stabilizing at just under 11,000 in 2009 **(Figure 9).** More recently, in response to the pandemic, numbers have increased. More than 12,000 bear permits were sold in 2020 (the highest number in 17 years) and sales increased again in 2021 to nearly 12,500.

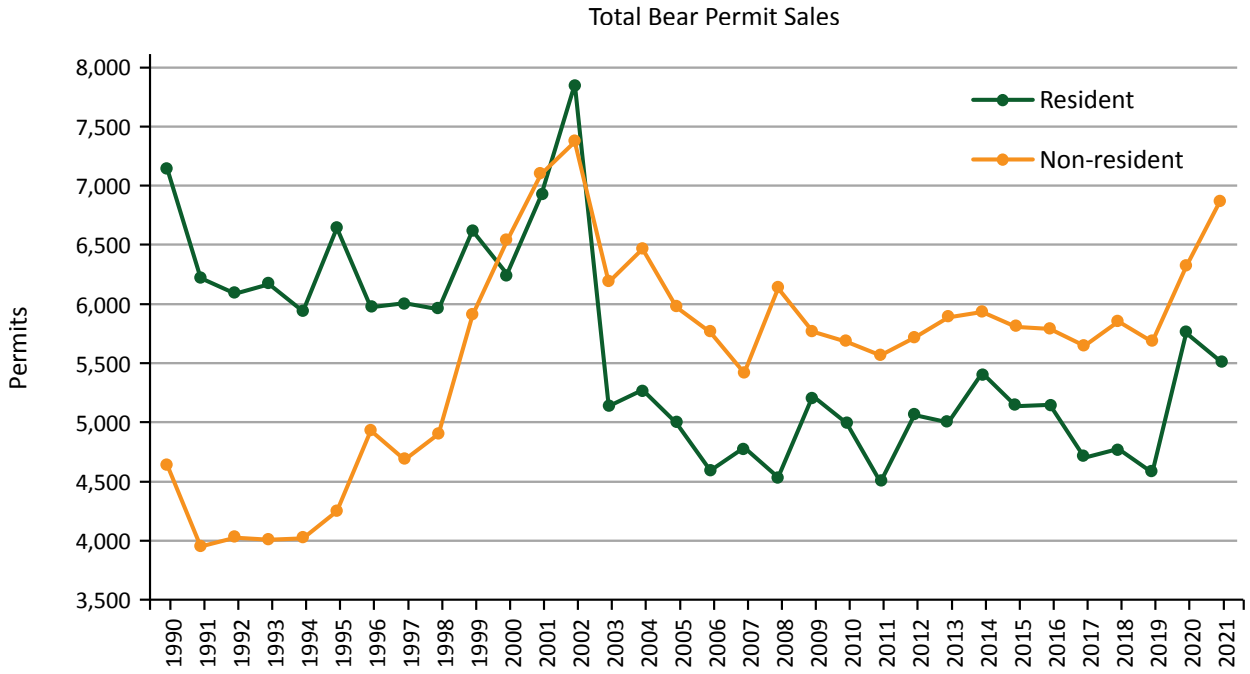
RESIDENT VS NONRESIDENT PARTICIPATION

Historically, most bear permits (55-60%) were purchased by residents. However, following the closure of the Ontario spring bear hunt in 1999, nonresidents became more interested in hunting Maine black bears; and in 2000, nonresident participation eclipsed that of residents. Since then, nonresidents have accounted for an average of 55% of bear hunting permits.

With the permit fee increase in 2003, resident participation fell more sharply. While not as many nonresidents dropped off, this decline is particularly significant since nonresidents' higher success rates have a greater impact on the final harvest level **(Figure 6).**

The bump in permit sales in 2020 and 2021 contributing to the near-record harvests of 3,883 and 3,779 bears, respectively **(Figure 9).** Most notable was the increase in nonresident participation in 2021 which likely explains the higher-than-expected 2021 harvest.

FIGURE 9. THE DEPARTMENT DOES NOT LIMIT THE NUMBER OF BEAR HUNTING OR TRAPPING PERMITS. IN RECENT YEARS, RESIDENT AND NONRESIDENT BEAR PERMIT SALES HAVE STABILIZED TO APPROXIMATELY 10,000 WITH A SIMILAR NUMBER OF RESIDENTS AND NONRESIDENTS PURCHASING PERMITS. PRIOR TO 2003, MORE RESIDENTS PURCHASED BEAR PERMITS, LIKELY DUE TO THE LOW COST OF THE PERMIT AT THE TIME.



NEW PERMITS FUNDING BLACK BEAR RESEARCH AND MANAGEMENT

Since 2008, trappers have been required to purchase a bear permit to harvest a bear, and nonresidents have also been required to purchase a permit to take a bear during deer firearms season. Funds from these permit sales are dedicated to bear research and management, and we are currently using them to:

- Determine the age of harvested black bears from teeth turned in by hunters
- Develop an integrated population model for bears, and
- Evaluate the role of anthropogenic foods (including bait) on Maine's bear population.

This research will allow us to improve our monitoring of trends in Maine's bear population, including its age structure and refine population estimates to better inform our management of bears.

Although the number of nonresident bear permit sales for deer hunting season has remained stable at 700 to 1,000 per year (962 in 2020), sales of resident and nonresident bear trapping permits have been increasing. The sale of these permits has contributed between $40,000 and $90,000 annually to bear research and management. In 2014, likely due to a ballot initiative that would have made it illegal to harvest bears with bait, trained dogs, or traps, the number of resident trapping permits more than doubled from 291 to 602, and nonresident trapping permits tripled from 25 to 75. Most recently, trapping permit sales reached new highs of 698 resident and 98 nonresidents in 2020 and 793 resident and 128 nonresidents in 2021.

This work is supported by the federal Pittman-Robertson program and state revenues from sales of hunting and trapping licenses.

FURBEARERS

Shevenell Webb

Trapping and Furbearer Management

With our abundant lakes, streams, and wetlands, plus southern hardwoods and northern boreal forests, Maine supports some of the most diverse wildlife assemblages in the Northeast. Maine has 16 species of furbearing animals, including semi-aquatic species (beaver, river otter, mink, and muskrat) and terrestrial species (bobcat, coyote, red and gray fox, fisher, marten, raccoon, opossum, striped skunk, short and long-tailed weasel, and red squirrel).

Thanks to modern wildlife management principles, many of these species are more abundant now than they were 100 years ago, allowing for more viewing and harvest opportunities. Game wardens strictly enforce harvest regulations, and wildlife biologists closely monitor the harvest. MDIFW continually reviews and develops science-based regulations, education programs, and capture methods to ensure the harvest is sustainable and that practices are humane.

Healthy furbearer populations are primarily managed and maintained through trapping. Regulated trapping provides many benefits to wildlife and people, including protection and restoration of rare species, population management, and reduction of human-wildlife conflicts.

Trapping Best Management Practices

Many advancements have been made to improve the safety, effectiveness, and humaneness of trapping. A new report summarizes a long-term study to evaluate trap performance and advance the use of humane traps through development of best management practices for trapping in the United States. Over 600 traps have been tested through the BMP study, which continues to this day. Learn more at **furbearermanagement.com.**

To learn more about Maine trapping regulations, please visit **mefishwildlife.com/trappinglaws.**

Harvest Update

Trapping is the primary method of harvesting furbearers; but red and gray fox, coyote, bobcat, raccoon, opossum, and skunk can also be hunted for a short time each year. Small game, including snowshoe hare, red and gray squirrel, woodchuck, and porcupine, can be hunted as well.

Regardless of harvest method, the pelts of all furbearers except weasels, raccoon, red squirrel, muskrat, skunk, and opossum must be registered and tagged. Tagging pelts gives the Department information on who harvested the animal, with what method, in which town, and during which month and year.

We also collect biological data for some species during the registration process (see page 32). This information is important for monitoring fur harvest intensity, status, and distribution, as well as the demographics of the harvest.

Many factors can influence fur harvests, including changes in trapping regulations, pelt values, wildlife populations, weather conditions, abundance of natural foods, and gas prices. Interest in trapping has remained steady, with more people taking trapper education courses in recent years. Some of the recent interest is related to bear trapping, while other people are drawn in by the challenges and benefits of being outside or the prospect of making their own fur garments and other products.

During the 2021/22 season, the covid pandemic, abundant natural foods, low fur values, and high gas prices all affected trapper effort and harvest.

Bobcat sightings are up, and the bobcat harvest continues to be strong **(Table 1).** Hunting is the most popular method of pursuing bobcats, with 58% of the annual harvest taken by hunting during the previous three seasons; but it relies on good snow conditions. Most bobcat hunters use dogs, followed by bait, other, calling, and incidental. Over the past 10 years, the number of successful bobcat hunters has doubled, while the number of successful trappers has increased by 15%.

The fisher and marten harvest this past season was comparable to the 2019 season when natural foods (e.g., small mammals and nuts) were abundant. Some species, like mink and foxes, were abundant; but because of low trapper effort, the harvest was well below the 10-year average.

Trapper Effort

The number of trapping licenses has been fairly stable over the last 20 years. During 2020/21, there were 4,312 trapping licenses (this includes annual and lifetime trapping licenses), representing a 5% increase from the previous five-year average. Beginning in 2021, trapping license renewals could be purchased online, including Apprentice Trapping, Bear Trapping Permit, and Junior Trapping Licenses. With that change, the Department saw a year-over-year increase in resident and non-resident trapping licenses.

All trappers 16 years and older are required to submit a fall and spring harvest report, even if they did not trap. MDIFW uses this information to monitor trends around targeted species and locations, catch per unit effort, disease, trapping effort in lynx wildlife management districts, and the harvest of species that are not required to be registered and tagged. These reports indicate that coyote and beaver are the most popular species to target. The average species catch per 100 trapnights (1 trap set for 1 night = 1 trapnight) reported on fall harvest reports (2018-2020) has been highest for muskrat (8) and beaver (4), followed by raccoon (3), otter (2), and coyote, fox, mink, fisher, marten, and bobcat (1) **(Table 2).**

TABLE 1. FURS REGISTERED FROM THE 2012/13 – 2021/22 TRAPPING AND HUNTING SEASONS IN MAINE.

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	10-YR AVERAGE
BEAVER	9,327	42,95	3,541	5,666	3,448	5,411	4,187	6,173	5,988	5,325	**5,336**
BOBCAT	239	136	126	228	207	221	281	352	396	354	**254**
COYOTE	1,746	1,315	1,036	1,429	963	1,482	1,965	1,905	1,912	1,158	**1,507**
FISHER	1,346	656	688	295	341	352	659	365	741	470	**591**
R. FOX	901	541	304	618	437	582	726	457	739	411	**622**
G. FOX	437	334	535	286	131	264	196	247	275	141	**259**
MARTEN	4,048	1,042	1,224	395	1,113	519	946	315	1,057	395	**1,105**
MINK	2,256	1,379	1,173	1,206	485	536	284	348	356	243	**827**
OTTER	762	408	292	494	322	656	397	678	628	582	**522**

TABLE 2. SPECIES CATCH PER 100 TRAP-NIGHTS AS REPORTED ON FALL TRAPPER HARVEST REPORTS.

SEASON	COYOTE	G. FOX	R. FOX	MINK	FISHER	MARTEN	BEAVER	MUSKRAT	RACCOON	OTTER	BOBCAT
2018	1.59	0.46	0.73	1.21	0.79	1.08	4.48	7.94	2.71	2.08	0.42
2019	1.14	0.58	0.61	1.06	0.75	0.78	4.18	7.42	0.88	1.34	0.65
2020	1.07	0.61	1.41	1.01	0.99	1.60	4.76	8.77	4.38	1.61	0.77
AVG	**1.27**	**0.55**	**0.92**	**1.09**	**0.84**	**1.15**	**4.47**	**8.04**	**2.66**	**1.68**	**0.61**

[1] *Imports and roadkills were excluded from this summary.*

Biological Data

MDIFW biologists collect biological samples from bobcat, fisher, marten, and river otter **(Figures 1-5).** By closely monitoring harvest demographics, we are able to improve how we manage these species and ensure that trapping and hunting levels are sustainable. We also use these data when interpreting harvest trends and considering regulation changes.

We have learned a lot in the past five years of the study. The harvest has been composed primarily of younger age classes, mimicking natural mortality trends. On average, 49% of the bobcat, 77% of the fisher, 76% of the marten, and 57% of the otter annual harvest samples were juveniles (<1 years old) or yearlings. The percentage of adult females (2+ years old) in the harvest has been low, representing 24% of the bobcat, 15% of the fisher, 6% of the marten, and 14% of the otter annual harvest samples. The oldest animals in the study were bobcat (13 years old), fisher (11 years old), marten (9 years old), and otter (15 years old).

FIGURE 1. AGE DISTRIBUTION OF THE SAMPLED BOBCAT, FISHER, MARTEN, AND RIVER OTTER HARVEST DURING THE 2020-21 HUNTING AND TRAPPING SEASON IN MAINE.

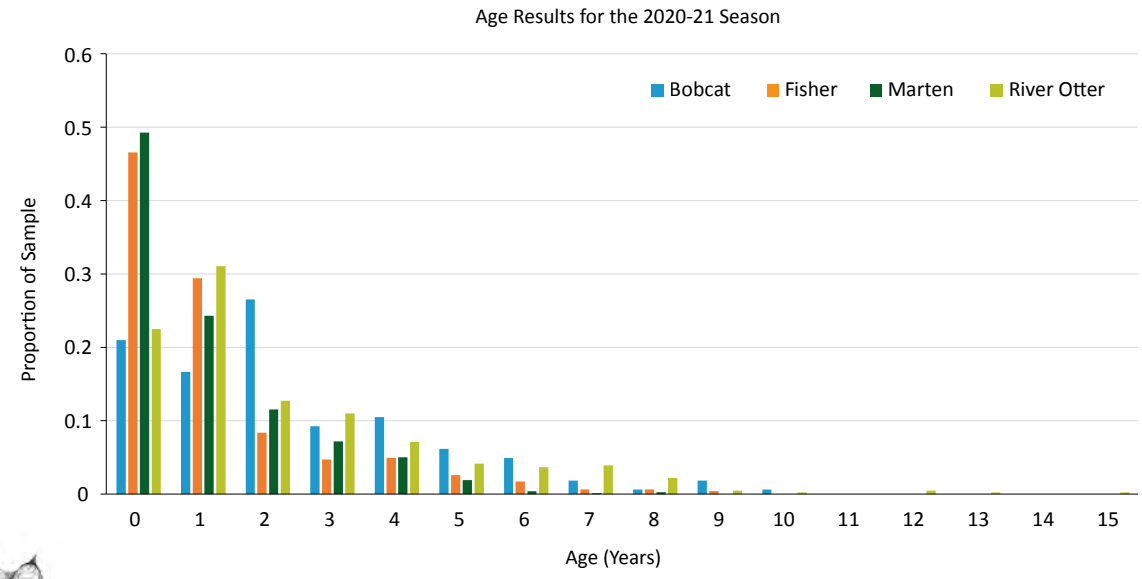
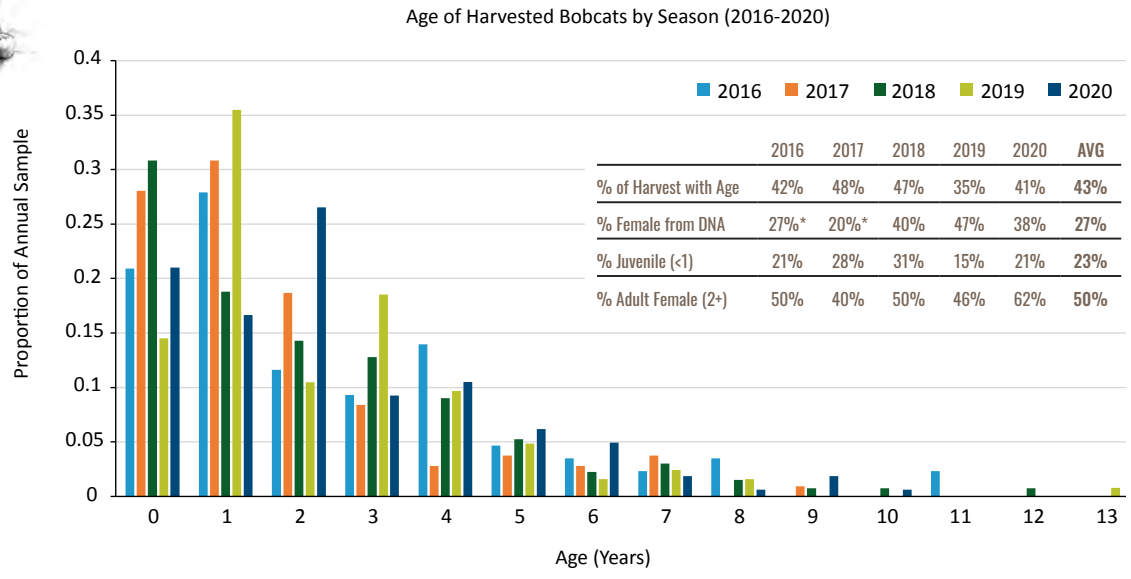
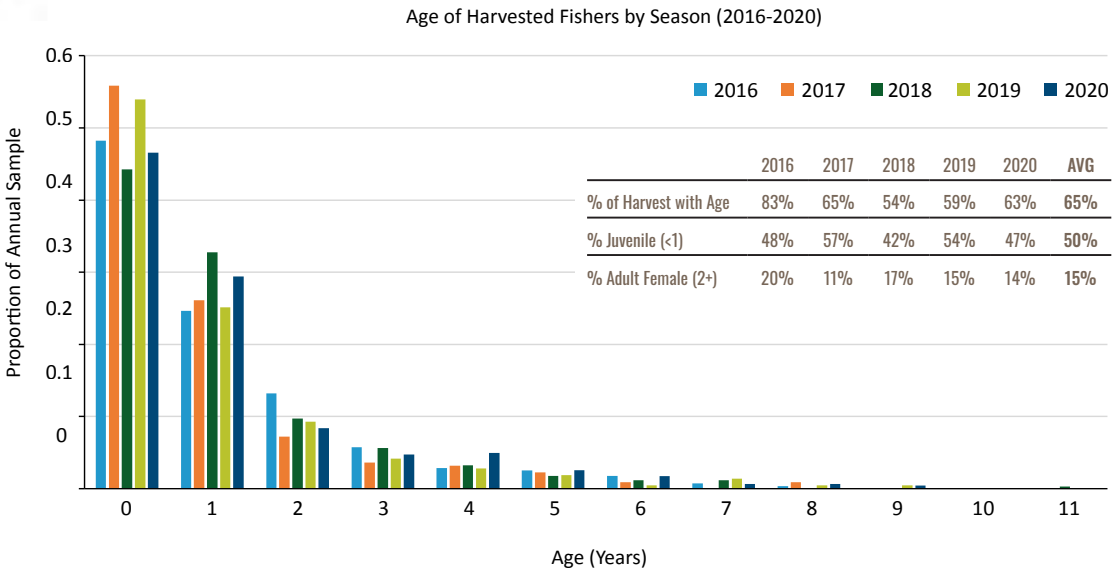


FIGURE 2. AGE AND SEX OF BOBCATS SAMPLED DURING THE 2016/17 – 2020/21 HUNTING AND TRAPPING SEASONS IN MAINE. NOTE THAT ASTERISKS* MARK RESULTS BASED ON VERY SMALL SAMPLE SIZE (I.E., LESS THAN 30 BOBCAT TISSUE SAMPLES).



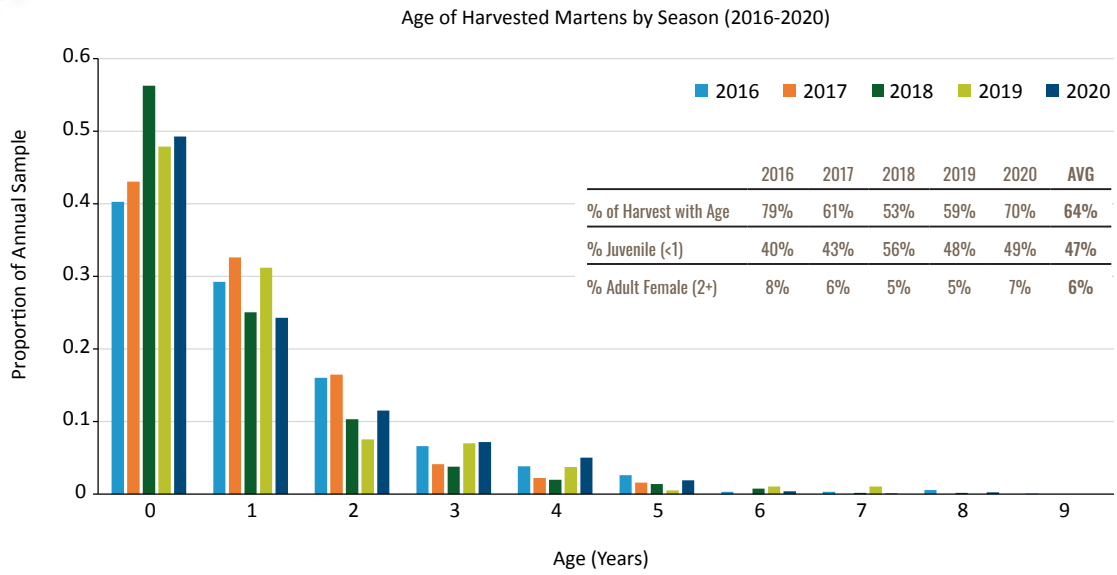
	2016	2017	2018	2019	2020	AVG
% of Harvest with Age	42%	48%	47%	35%	41%	43%
% Female from DNA	27%*	20%*	40%	47%	38%	27%
% Juvenile (<1)	21%	28%	31%	15%	21%	23%
% Adult Female (2+)	50%	40%	50%	46%	62%	50%

FIGURE 3. AGE AND SEX OF THE FISHER SAMPLED DURING THE 2016/17 – 2020/21 TRAPPING SEASON IN MAINE.



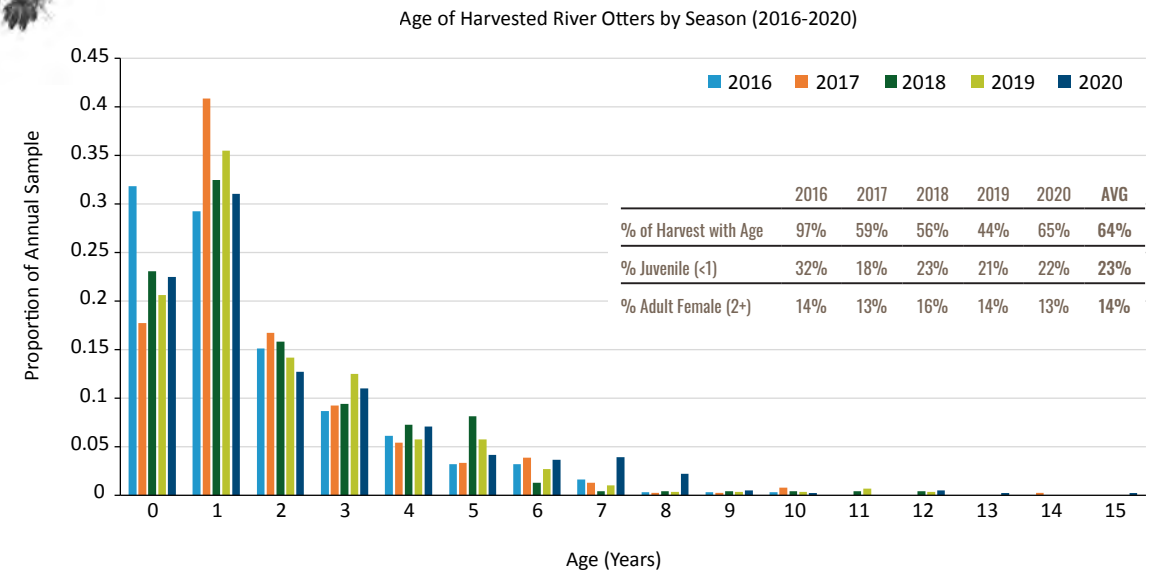
	2016	2017	2018	2019	2020	AVG
% of Harvest with Age	83%	65%	54%	59%	63%	65%
% Juvenile (<1)	48%	57%	42%	54%	47%	50%
% Adult Female (2+)	20%	11%	17%	15%	14%	15%

FIGURE 4. AGE AND SEX OF THE MARTEN SAMPLED DURING THE 2016/17 – 2020/21 TRAPPING SEASON IN MAINE.



	2016	2017	2018	2019	2020	AVG
% of Harvest with Age	79%	61%	53%	59%	70%	64%
% Juvenile (<1)	40%	43%	56%	48%	49%	47%
% Adult Female (2+)	8%	6%	5%	5%	7%	6%

FIGURE 5. AGE AND SEX OF THE RIVER OTTER SAMPLED DURING THE 2016/17 – 2020/21 TRAPPING SEASON IN MAINE.



	2016	2017	2018	2019	2020	AVG
% of Harvest with Age	97%	59%	56%	44%	65%	64%
% Juvenile (<1)	32%	18%	23%	21%	22%	23%
% Adult Female (2+)	14%	13%	16%	14%	13%	14%

Other Updates

FURBEARER PLANNING

As part of its mission to preserve, protect, and enhance Maine's inland fisheries and wildlife resources, the Maine Department of Inland Fisheries and Wildlife also must plan for the use and preservation of these resources.

In 2019, the Department started a comprehensive Furbearer Planning initiative. This effort is guided by a Steering Committee made up of diverse wildlife stakeholder groups and species working groups with technical expertise and/or interest. These groups are helping the Department develop 10-year management goals and strategies in three areas: 1.) Research and monitoring, 2.) Policy and regulations, and 3.) Outreach and communications.

The plan's overarching goals are to maintain healthy, abundant furbearer populations, maintain a sustainable harvest, maintain trapping opportunities, increase public understanding of furbearers and furbearer management, minimize human-wildlife conflicts, and conserve other species in the process. Given the wide scope and number of species involved, this initiative spans multiple years. Learn more about the 2020 public survey results and progress of Maine's Furbearer Management Plan: **maine.gov/ifw/fish-wildlife/wildlife/species-planning/furbearer-management-plan.html.**

Meso-Carnivore Camera Study

Since 2017, the Department has been working with the University of Maine (Dr. Alessio Mortelliti and Dr. Bryn Evans) to develop a protocol for monitoring marten and fisher populations across the state. We used motion-triggered camera traps because they are an effective, non-invasive approach to survey carnivores over large areas and have advantages over traditional methods like snow track surveys. Cameras are not weather-dependent, they provide more certain species identification, and they can be set for long periods of time.

The study focused on the northern two-thirds of Maine across gradients of forest disturbance, latitude, and fur harvest intensities. Marten and fisher occurrences were collected through transects of camera traps optimized for these species. Over a four-year period, the 197 survey stations collected nearly one million images of 27 mammal species.

The study found that the intensity of forest disturbance was an important driver for marten occurrence. More disturbed forests indicated more ephemeral marten populations with high turnover (i.e., less consistency in annual detections) as compared to less disturbed areas. In contrast, fisher were common almost everywhere (86% of stations) and appeared to be more habitat generalists.

Marten make a great umbrella species, and survey efforts targeting marten can be maximized to include fisher and other species. The Department is using the results from this study to inform a long-term monitoring program that will improve marten and fisher management. Learn more about the publications that resulted from this study: **alessiomortelliti.weebly.com/publications.html.**

Fisher Rodenticide Study

The Department is collaborating with partners from multiple states on a large study to better understand the health of the fisher population, including the prevalence of anticoagulant rodenticides (AR), in the Northeast. Rodenticides are commonly used to control rodents worldwide, but the effects of these toxins on other species and their persistence in the environment is not well-understood.

AR accumulate in the liver and work by interfering with Vitamin K activation and preventing blood from clotting. A rodent who ingests the toxins typically dies of internal bleeding, hemorrhaging, or anemia within four days to two weeks. First-generation anticoagulants were developed before 1970 and are more toxic when feeding occurs over several consecutive days. Second-generation anticoagulants were developed beginning in the 1970s to control rodents that became resistant to the first-generation rodenticides. These anticoagulants are more toxic because they can kill rodents after one night of feeding, which increases their potential to harm non-target animals. The second-generation compounds also appear to stay in animal tissue for a long period of time. Due to these factors, the Environmental Protection Agency (EPA) has instituted additional restrictions for these compounds, allowing consumers to purchase ready-to-use bait stations that contain a block or paste inside them, but not to purchase pellets. Only three compounds are currently registered for the consumer market to control mice and rats. Although the EPA restricts the more potent second-generation products to agricultural contexts and professionals, they are still widely available to consumers at local hardware stores and online vendors.

The various pathways of AR exposure may be feeding directly on the baits, feeding on rodents who have eaten the baits, or other means (e.g., water sources). A predator who ingests poisoned rodents can build up toxins over time as they eat more of them; and some species, like avian predators, appear particularly sensitive and can die from AR poisoning. Massachusetts has found that raptors have widespread exposure to AR, but just reported its first lethal rodenticide poisoning of two bald eagles in 2021. In addition to avian predators, rodenticide compounds have been detected in Canada lynx, bobcat, red fox, gray fox, river otter, and fisher in the Northeast. Lethal concentrations are not well understood and appear to vary widely within and among species.

During the fall and winter of 2020/21, the Department worked with trappers and staff to collect 110 fishers from 49 Maine towns. Early results indicate 53% of the Maine fisher tested positive for at least one rodenticide compound **(Figure 6).** Four of the 11 rodenticide compounds tested were detected in Maine fisher livers, with Brodifacoum and Bromadiolone (second-generation anticoagulants with long half-lives) being the most common. Most of the fisher that tested positive had one or two compounds, while four had three compounds and one had trace amounts of four compounds. Twenty-six of the 46 males (57%) and 30 of the 60 females (50%) had at least one compound. Fishers with rodenticides were detected throughout the state, and it appears that fisher living in remote areas are still getting exposed. Some towns had a mix of individuals that tested negative and positive. Still, levels in Maine are lower than New York, where 79% of fisher tested positive for at least one rodenticide, and Vermont, where 90% did. SUNY ESF will be examining age, reproductive tracts, and testes from fisher in relation to rodenticide levels.

More study is necessary to better understand AR exposure pathways, rates for fisher and other species, and what levels would be harmful to individuals or populations. Given the widespread availability of rodenticides to consumers, increased outreach is needed on integrated pest/rodent management and alternatives to poisons (e.g., snap traps).

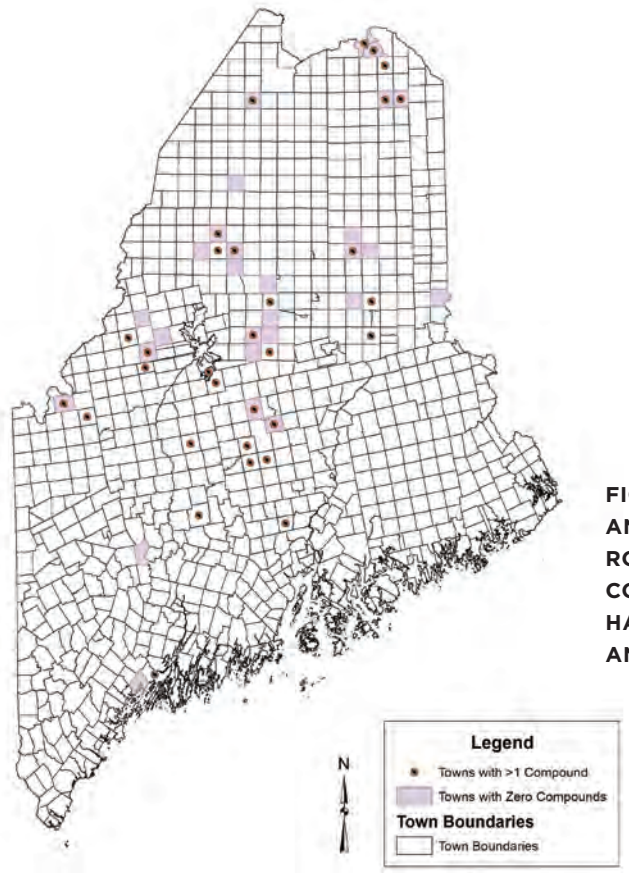


FIGURE 6. MAP SHOWING MAINE TOWNS WHERE AN INDIVIDUAL FISHER HAD NO ANTICOAGULANT RODENTICIDE COMPOUND (SHADED) OR AT LEAST ONE COMPOUND (SOLID CIRCLES) DETECTED. SOME TOWNS HAD A MIX OF INDIVIDUALS THAT TESTED NEGATIVE AND POSITIVE FOR COMPOUNDS.

Skunk Adenovirus Study

Skunk adenovirus (SkAdv1) is an emerging respiratory disease that was first discovered in a striped skunk in Ontario in 2014. Since then, its host range has expanded, with several species in northeastern North America infected, including porcupines, gray fox, and raccoon. The virus has also been discovered in captive hedgehog colonies in Japan and New Hampshire. Its source is unclear, with a mixture of cases coming from sick wildlife submitted to wildlife rehabilitation with symptoms and animals who develop symptoms while in a rehabilitation center. There appear to be split outcomes, with some infected animals recovering and others dying. According to Dr. David Needle (UNH Veterinary Diagnostic Lab), who first discovered the virus in the United States, it appears that, of the animals infected and developing the disease, porcupines are the ones that people see most.

It is unknown how the virus impacts wildlife populations, but it may be species- and strain-dependent. Based on preliminary evidence from UNH and collaborators at Cornell and in Canada, it appears fairly transmissible to other species and warrants further study as it is currently emerging in the northern portion of North America's eastern temperate forests, seemingly focused on Maine, New York, and the surrounding Canadian provinces. The Department will be collaborating with Dr. Needle, Dr. Sarah Childs-Sanford (Cornell University), select wildlife rehabilitation centers, and other partners to collect samples from multiple species to learn more about which species carry the virus and how prevalent the disease is among individuals.

GAME BIRD CONSERVATION & MANAGEMENT

Meet the Game Bird Group

Brad Allen, Wildlife Biologist and Bird Group Leader

Brad oversees bird group activities and budgets and continues to investigate the lives and times of the common eider, focusing currently on a collaborative duckling survival study. Brad also coordinates Department interests in seabird research and management activities.

Kelsey Sullivan Wildlife Biologist

Kelsey coordinates MDIFW's banding programs, surveys, and research to assess the status of game bird populations in Maine. Game bird species that Kelsey is responsible for include ruffed grouse, American woodcock, wild turkeys and waterfowl. He is Maine's representative on the Atlantic Flyway Council Technical Section.

GAME BIRDS

Kelsey Sullivan

RESIDENT GAME BIRDS

Wild Turkey Spring Harvest

Maine continues to have a quality wild turkey spring hunting season, with 25% of hunters harvesting at least one turkey and 37% of those successful hunters harvesting a second turkey. The spring 2022 harvest of 7,081 was the highest recorded since the start of spring turkey hunting in Maine in 1986, when just seven of 500 permitted hunters harvested a wild turkey.

Factors contributing to the highly successful 2022 season include an increase in wild turkey hunting participation, good reproduction over the last couple years, and favorable weather conditions during the opening week of the spring hunt.

The table below shows the spring wild turkey harvest each year from 2018 to 2022 by Wildlife Management District (WMD), along with the average harvest over those five years.

TABLE 1. WILD TURKEY SPRING HARVEST BY WILDLIFE MANAGEMENT DISTRICT 2018 TO 2022 AND FIVE YEAR AVERAGE.

WMD	2018	2019	2020*	2021	2022	AVERAGE HARVEST
2	4	5	4	3	4	4
3	3	6	9	20	22	12
4	1	1	6	5		3
5	2	6	2	14	9	7
6	48	49	37	90	120	69
7	29	52	24	37	57	40
8	7	14	10	19	35	17
9	6	4	0	9	13	6
10	9	4	0	18	22	11
11	71	75	40	71	125	76
12	91	176	118	164	201	150
13	117	122	35	87	172	107
14	43	55	20	53	66	47
15	643	592	567	605	720	625
16	455	523	457	464	551	490
17	675	603	461	562	681	596
18	118	104	149	92	97	112
19	28	20	54	22	37	32
20	604	705	521	701	719	650
21	608	666	481	651	720	625
22	571	607	526	439	525	534
23	754	765	679	607	749	711
24	174	172	180	185	195	181
25	586	687	558	498	631	592
26	450	456	458	302	406	414
27	70	68	51	97	118	81
28	40	67	58	58	66	58
29	20	8	13	18	20	16
TOTAL	6,230	6,612	6,216	5,891	7,081	6,406

**Estimated from a post season harvest survey. In 2020, due to COVID, spring harvest registration was waived.*

Wild Turkey Fall Harvest

The fall wild turkey season is open from the Monday closest to September 17 until November 7. Bag limits vary by Wildlife Management District (WMD) and are based on each WMD's estimated wild turkey density (WMDs with higher estimated turkey densities have higher bag limits). The overall season bag limit per hunter is five wild turkeys.

The fall 2020 wild turkey harvest was the highest we've had in the state since the fall season began in 2002, with a total harvest of 3,645 turkeys — 44% more than the 5-year average of 2,515. The higher harvest is partially attributed to the increase in wild turkey hunting participation in 2020, as measured by hunting license and wild turkey permit sales. 2020 was also a very good year for wild turkey reproduction, so there were a lot of wild turkeys on the landscape and available for harvest.

The fall 2018 harvest of 3,503 wild turkeys was also due in part to successful reproduction.

TABLE 2. WILD TURKEY FALL SEASON HARVEST TOTALS BY WILDLIFE MANAGEMENT DISTRICT FROM 2016 TO 2020.

WMD	2016 HARVEST	2017 HARVEST	2018 HARVEST	2019 HARVEST	2020 HARVEST	5 YEAR AVERAGE
6	CLOSED	CLOSED	CLOSED	CLOSED	66	66
10	2	8	7	8	19	9
11	46	32	61	30	71	42
12	57	29	107	29	80	50
13	67	10	59	7	30	34
15	307	155	418	196	400	283
16	242	97	371	140	332	211
17	362	146	345	272	363	276
18	62	42	80	48	86	61
19	39	16	35	21	37	32
20	307	212	350	191	384	292
21	194	127	244	154	236	197
22	214	112	301	130	257	196
23	235	154	407	260	369	260
24	99	58	64	57	102	82
25	232	123	340	185	408	233
26	169	81	149	156	292	150
27	CLOSED	42	54	41	57	49*
28	73	68	107	46	116	72
29	21	9	4	4	6	11
TOTAL	2,761	1,521	3,503	1,975	3,711	2,515

**4 year average*

MIGRATORY GAME BIRDS

Waterfowl Harvest

The 2020 Maine waterfowl season selection continued with three zones: North, South, and Coastal. The federal framework offered states in the Atlantic Flyway a 60-day general duck season with a six-bird daily bag limit, a 60-day Canada goose season with a two-bird daily bag limit in our North and South Zones, and a 70-day Canada goose season with a three-bird daily bag limit in our Coastal Zone. An early Canada goose season was also open from September 1 to September 25. This season was for the more abundant portion of the Canada goose population breeding in Maine, referred to as resident Canada geese. The regular goose season is timed for when the less abundant geese migrating from the northern breeding grounds in Canada co-mingle with the resident geese. The early season daily bag limit was 10 in the South and Coastal zones and six in the North zone. The special sea duck season in Maine was limited to 60 days with a daily limit of five sea ducks per day with no more than four scoters, four eiders, or four long-tailed ducks per day.

Waterfowl harvest estimates are derived from data collected through the Harvest Information Program (HIP). Led by the federal US Fish and Wildlife Service, the HIP program is an annual hunter survey to monitor waterfowl harvest. All hunters intending to hunt waterfowl must register for HIP each year when they purchase their hunting license. Duck and goose harvest estimates for the 2016 to 2020 hunting seasons, along with the 5-year average, are presented in the table below.

TABLE 3. WATERFOWL HARVEST IN MAINE BY SPECIES FROM 2016 TO 2020 FIVE YEAR AVERAGE.

	2016	2017	2018	2019	2020	5 YEAR AVERAGE
Black Duck	2,700	2,900	5,600	2,700	3,500	3,480
Mallard	8,000	9,700	11,800	6,300	10,400	9,240
Mallard X Black Duck Hybrid	100	200	100	100	300	160
Green-Winged Teal	1,900	1,600	1,100	1,900	2,100	1,720
Blue-Winged Teal	200	0	0	200	600	200
Northern Shoveler	0	100	0	100	0	40
Northern Pintail	100	200	400	100	200	200
Wigeon	100	0	200	200	100	120
Wood Duck	5,500	6,500	3,700	4,600	9,800	6,020
Greater Scaup	0	0	100	0	0	20
Lesser Scaup	100	0	0	0	100	40
Ring-Necked Duck	800	200	800	900	1,200	780
Bufflehead	2,500	1,500	2,700	700	2,400	1,960
Common Goldeneye	600	600	700	400	900	640
Hooded Merganser	600	600	600	400	900	620
Other Mergansers	700	500	700	200	900	600
Total Dabbling/Diving Duck Harvest	27,000	32,200	39,400	22,900	40,600	32,420
Canada Goose	11,400	15,200	11,400	7,200	14,300	11,900
Common Eider	1,800	5,700	7,300	1,700	2,200	3,740
Long-Tailed Duck	800	1,700	2,600	1,300	2,400	1,760
Scoter Species	1,100	1,300	800	1,100	2,400	1,340
TOTAL SEA DUCK HARVEST	3,700	8,700	10,700	4,100	7,000	6,840

American Woodcock

Surveyors in Maine contributed to the USFWS-coordinated American Woodcock Singing Ground Survey (SGS), which is carried out each spring across the woodcock breeding range in Eastern Canada and the central and eastern US. MDIFW and USFWS staff, together with several volunteers, completed 55 routes in Maine in the spring of 2021. The average number of males they heard per route was 3.73, up from the previous year's average of 3.45, but slightly lower than the 10-year average of 3.96. These numbers indicate that the breeding portion of woodcock is stable in Maine, despite having declined in many other parts of the woodcock range. Such declines are attributed in part to loss of young forest habitat important to woodcock.

As with waterfowl, the Harvest Information Program (HIP) provides estimates of woodcock hunter numbers and harvest. Based on data from HIP, approximately 5,500 woodcock hunters harvested an estimated 9,600 woodcock in Maine in 2020.

The recruitment index is a measure of the ratio of immature (young of the year) woodcock per adult female derived from a wing-collection survey. In 2020, Maine hunters provided 770 woodcock wings. The recruitment index of 1.7 immature to one adult female in the 2020 harvest was the same as the long-term average of 1.7 (1963–2019).

2021-2022

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» Bird Conservation & Management

» Reptile, Amphibian, and Invertebrate Conservation & Management

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WILDLIFE MANAGEMENT

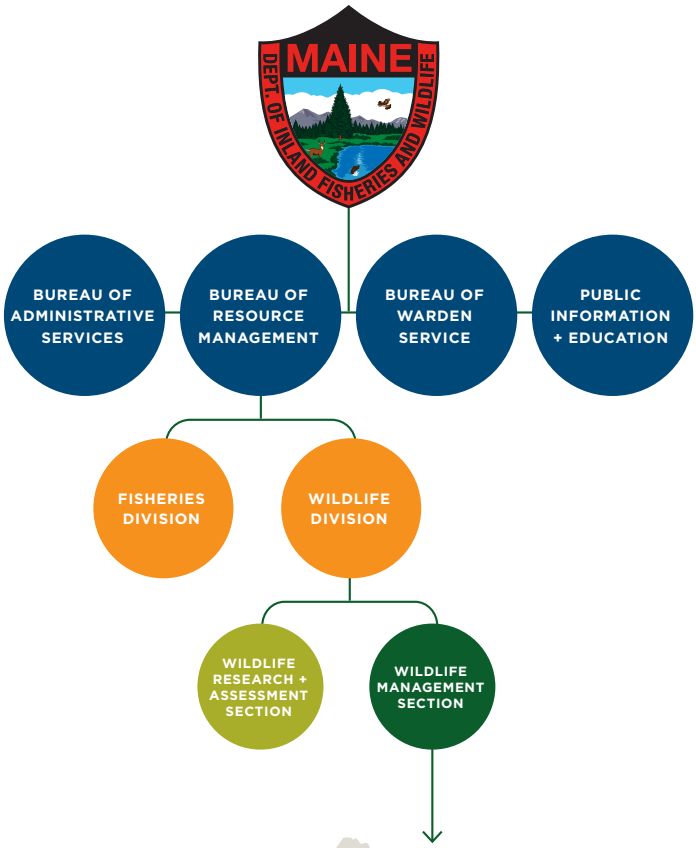
Ryan Robicheau
Wildlife Management Section Supervisor

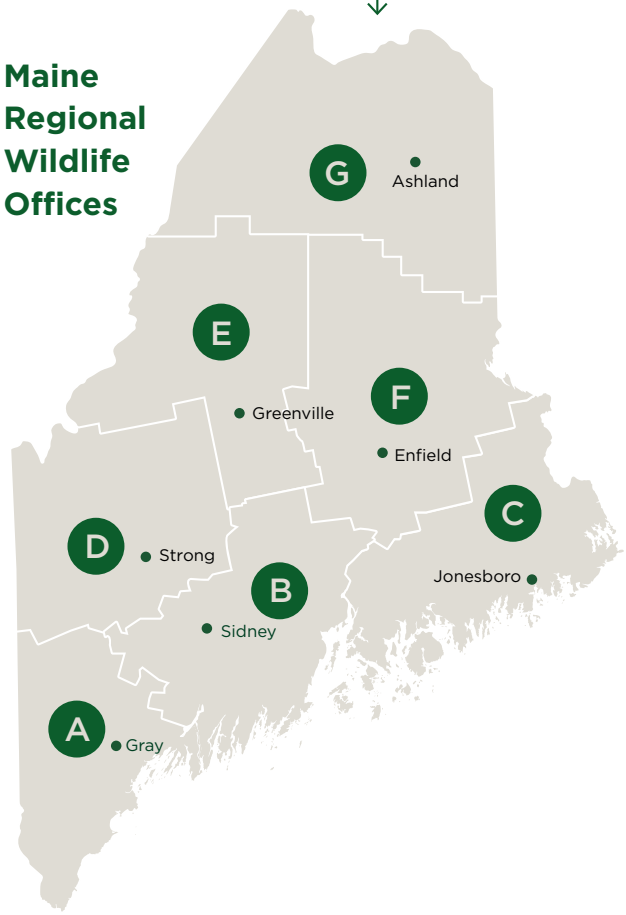
The following pages highlight work activities of the Wildlife Management Section over the past year, covering a wide array of topics that the dedicated men and woman within the Section have been engaged in. These range from contaminant sampling in wildlife species to timber harvesting for habitat management.

The Section is composed of two or three wildlife biologists in each of our seven geographic districts throughout the state; our Lands Management Program; a wildlife biologist assigned to the Maine Department of Agriculture, Conservation and Forestry; and a wildlife biologist who provides technical assistance to private landowners. Combined, our staff provide a suite of services to other sections of the Department, other state agencies, the public, and conservation partners.

The Wildlife Management Section engages in all Wildlife Division efforts, including:

- Biological data collection for game species
- Non-game wildlife surveys
- Species management and planning
- Environmental review of development projects
- Administration/coordination of the nuisance wildlife policy
- Administration/coordination with wildlife rehabilitators
- Technical assistance to landowners
- Management of Department-owned Wildlife Management Areas
- Oversight of conservation easements held by the Department





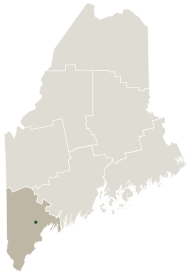
Priorities identified in recent Department planning efforts have refined the Section's efforts to achieve Department goals. We have enhanced our capabilities to provide technical assistance to private landowners, we are engaging with conservation partners to address climate change (including increased saltmarsh and coastal ecosystem restoration/conservation efforts), and we have renewed our efforts to acquire deer habitat land in northern, eastern and western Maine.

As part of the Beginning with Habitat program, the Wildlife Management Section increased its capacity to engage with landowners interested in managing their land and its habitats in a specific way. For example, one landowner's objective might be to benefit Species of Greatest Conservation need identified in the State Wildlife Action Plan, or to promote biological diversity, while another may want to focus on creating and maintaining high quality habitat for popular game species.

Throughout last year, the Department coordinated with stakeholders from Virginia to Maine in a region-wide effort to conserve and restore coastal saltmarsh habitats. Legacy agricultural practices in marshes, tidal restrictions created by transportation infrastructure, and climate change have all heightened the focus on these valuable ecosystems and the important wildlife habitats they provide. Our goal in this effort was to prioritize Maine marshes for restoration and conservation funding. As a result, numerous restoration projects have been implemented, with the Department engaged in projects at the Scarborough Marsh Wildlife Management Area, R. Waldo Tyler Management Area, and two marshes at the Kennebec River Estuary Wildlife Management Area. Conservation partners have also taken the lead on marshes scattered across the coast of Maine.

In 2021, The 130th Maine State Legislature passed an "Act to Preserve Deer Habitat" (H.P. 288 – L.D. 404), creating a new effort to conserve and manage deer habitat in northern, eastern, and western Maine. Per this legislative directive, the Department has prioritized and actively pursued conservation of areas important to deer in places where winter shelter is critical to survival. The legislation created staff capacity to focus on these important habitats and enhanced conservation funding opportunities through the Land for Maine's Future program. It also increased our capabilities to acquire and manage lands through the Deer Management Fund, which is supported by harvested deer registrations. Lands acquired under this effort will be incorporated into the Wildlife Management Area system, with a focus on management for deer habitat and public access.

The ensuing report provides a view into the diverse nature of the Wildlife Management Section's work this past year. As you'll see, much of this involves engagement with other Department staff and conservation partners to balance the biological and social aspects of protecting, conserving, and enhancing Maine's wildlife resources.



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Scarborough Marsh Wildlife Management Area

A time to celebrate 50 years, plovers, terns, New England cottontail, and more

Sean Campbell

Scarborough Marsh Wildlife Management Area (SWMA) is a wildlife oasis in the middle of one of Maine's most populated coastal areas. Situated to the south of Portland and to the north of Biddeford, Saco, and Old Orchard Beach, this WMA is an essential breeding, resting, and foraging area for waterfowl, shorebirds, wading birds, numerous marine species, and other diverse wildlife species. Spanning more than 3,000 acres, it is the largest marsh system in the state and consists of high and low marsh communities, regularly and irregularly flooded salt marsh, salt creeks, coastal fresh marsh, tidal flats, and upland habitats. The marsh is fed by three major tributaries: the Scarborough, Nonesuch, and Libby rivers.

Scarborough Marsh Wildlife Management Area

The Department began to acquire land for the Scarborough Marsh WMA in 1959. Being primarily wetland, the main management objective was to protect and improve the area for resident and migratory waterbirds. The WMA provides critical habitat for a broad array of waterfowl, saltmarsh and nelson's sparrow, egrets, and herons. And many shorebird species depend on its rich ecosystem for food, nesting habitat, and a place to rest during migration. The WMA is used by the state-endangered piping plover *(Charadrius melodus)*, least tern *(Sterna antillarum)*, New England cottontail *(Sylvilagus transitionalis)*, and Least Bittern *(Ixobrychus exilis)*. It is also heavily utilized by the public. The Department manages for appropriate public access and recreation, including consumptive activities (hunting, trapping, and fishing) and non-consumptive uses (canoeing, kayaking, hiking, birding, and wildlife viewing). The marsh also sustains local businesses in the realms of clamming, aquaculture, guide services, restaurants, and tourism; and it provides ecological services ranging from protection against coastal storms to carbon sequestration.

New England Cottontail (NEC) is the only rabbit native to Maine and is listed as state-endangered with an estimated state population around 300 individuals. NEC are an obligate early successional species that have suffered dramatic population declines since the 1960, primarily due to habitat loss and fragmentation. Currently, NEC only occur in six Maine towns and one WMA: SWMA. In March 2022, as part of the range-wide and state recovery strategy, MDIFW staff released eight rabbits into the Gervais parcel in an effort to re-establish a population. Prior to the release, NEC had not been documented in SWMA since 2010.

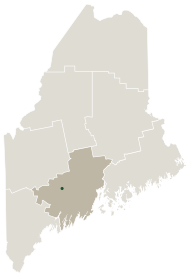
The released rabbits were fitted with radio telemetry collars, and we are currently monitoring their survival and trail cameras pictures have confirmed a successful breeding season. The 46-acre Gervais parcel where the rabbits were released was acquired in 2009, and MDIFW has managed it, along with surrounding uplands, for early successional habitat through forest management practices, native shrub plantings, invasive species control, prescribed fire, and mowing. We will conduct tracking and pellet surveys in the winter of 2022 to estimate abundance and breeding success. We anticipate releasing additional rabbits at Scarborough Marsh in fall 2022 and in 2023. Partners assisting in this project have included USFWS, breeding programs at Rodger Williams Park Zoo, Queens Zoo, Great Bay National Wildlife Refuge, and Patience Island, and volunteer citizen scientists who have contributed countless hours of work.

New England Cottontail

The three-acre Higgins Beach Unit of Scarborough Marsh is a disjunct parcel from the rest of the marsh. However small and separate, this essential coastal dune habitat plays a critical role in the recovery of Maine's piping plovers and least terns. It hosts over 70 least tern nests and a growing number of nesting piping plovers, numbered at six pairs in 2022. Since MDIFW owns this area, we have been able to increase seasonal management efforts, such as dog restrictions on the beach, increased educational signage, and symbolic and electric fence exclosures. A group of over 40 volunteers has been working to protect the nests and encourage the birds to settle and nest earlier in the year. Partnering with Maine Audubon staff to help monitor and manage for plover and terns across the state, our staff documented the earliest plover nest to hatch this year in Maine on May 24th at the Higgins Beach Unit.

This year, MDIFW celebrated 50 years of partnership with Maine Audubon at the Scarborough Marsh WMA. In 1972, Maine Audubon converted on old clam shack on the edge of the marsh into the Scarborough Marsh Audubon Center. Since its beginnings, the center has grown to serve the local community and visitors alike. Audubon Center Director Linda Woodard, who has worked tirelessly on the marsh for over 35 years, has grown the programs to engage over 10,000 people annually, including over 1,500 school children. The center serves as a focal point to engage the public on the importance of the marsh through naturalist guided tours, exhibits, a nature store, a nature trail, and canoe and kayak rentals.

Looking into the future, management actions on SWMA will continue to focus on providing optimal habitat for migratory waterfowl, shorebirds, fish, NEC, and a diversity of other species while balancing the increased demand for public access and use of these resources. Some of the challenges this management area faces stem from historical uses of the marsh, like ditching and plugging for agriculture, saltmarsh hay production, and mosquito control, large berms for railroads and roads that intersect the marsh, water control structures, and undersized culverts that restrict natural flows of water. Climate change and sea level rise bring new challenges that will impact our ability to manage the marsh for wildlife species. And phragmites and other invasive species also threaten the natural ecosystem and ability to provide optimal habitat. Targeted management actions in the past have addressed some of these issues; and as we move forward, we will continue collaborating with other entities to develop a comprehensive understanding of these natural and man-made processes across the entire marsh. All of this will help guide our management actions to sustain SWMA's ecological services and promote its resilience to sea level rise.



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Investigating PFAs in Maine Wildlife

Kendall Marden

As Regional Wildlife Biologists, we expect to deal with a wide variety of projects. Some are routine and seasonal, while others are novel but ephemeral. This past year, we embarked on a large project in central Maine that will continue to gain statewide significance. Growing awareness of — and broad concerns about — PFAS in the environment prompted this new area of investigation.

PFAS is an acronym for per- and polyfluoroalkyl substances — a group of thousands of manmade chemicals. The six that have been studied most are associated with health issues including increased cholesterol, decreased birth weights, reduced immune response from vaccines, and increased risk of kidney and testicular cancer. They have been used in a household products, clothing, and other manufactured goods, largely for their water- and grease resistant properties, and are also found in certain types of firefighting foam.

These chemicals often end up in food, water, and elsewhere in the environment, where they are consumed or inhaled by humans and animals. While much is still unknown, the body of information linking PFAS to negative health issues is growing, and many State of Maine agencies are working diligently to better understand their prevalence and impacts. Given the crossover of many issues, those agencies have been communicating and assisting one another regularly.

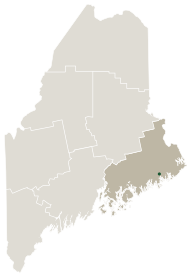
MDIFW's responsibility lies in managing wildlife and fish, including human/wildlife interfaces. While Maine CDC has the lead role on consumption advisories for both salt and freshwater fisheries, they along with other agencies will be helpful in assisting MDIFW in understanding more about PFAS compounds in wildlife. Given the breadth and depth of the issue, our focus will be the distribution and quantity of PFAS in wildlife to inform if and where we should issue an advisory on wild game consumption to protect public health.

Areas of greatest concern for environmental contamination in Maine stem from the past spreading of sludge on agricultural areas as a fertilizer. Two locations that had repeated application of firefighting foam are also a potential concern. Our focus on testing wildlife so far has been in the greater Fairfield area, which has been identified as a hot spot for past sludge spreading. This investigation will likely be ongoing for some time, though we are working diligently to learn as much as we can in a timely fashion.

In the fall of 2021, we tested eight deer from a small area with highly contaminated soils to see if PFAS was present in the deer. Our findings prompted a consumption advisory on deer for a large area out of an abundance of caution.
We have since started a much larger research project aimed at investigating deer and wild turkey in the Fairfield area. Beginning in the spring of 2022, MDIFW worked with nearly 60 private landowners and USDA-Wildlife Services to collect and test 71 turkeys, and 60 deer for PFAS. Our goal is to better understand if PFAS is present in animals in an area, and to what level it exists. This will allow us to determine if advisories are needed, and in what area they would apply.

Understanding PFAS distribution in wildlife will be more difficult than working with plants and domestic animals that are stationary or fenced in. Wildlife is more mobile, and there are still lots of questions about how animals consume and excrete PFAS, and how quickly levels rise or drop in the muscle tissue when exposure changes. New information on PFAS distribution and levels in soil and water will help direct our research in wildlife.

This is a complicated issue that will continue to develop, likely for years. As we work to comprehend the situation, we expect to have positive information to share, along with possible advisories. For more information on PFAS in Maine see **www.maine.gov/dep/spills/topics/pfas/** or **www.maine.gov/ifw/hunting-trapping/hunting/species/deer/deer-consumption-advisory.html#whyadvisory**



REGION C
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Offshore surveys in Region "Sea"

Christine West

Over the last year, the biologists in Region C have visited conservation easements, checked on deer wintering areas, attended meetings and trainings, presented at public speaking events with local partners, worked with local school groups, handled nuisance wildlife calls and emails, participated in duck banding and satellite tagging, surveyed for American woodcock, ruffed grouse, nightjars, marsh birds, breeding birds, peregrine falcons, amphibians and reptiles, captured and fitted a satellite transmitter on a great blue heron, collected white-tailed deer bio data, and deployed bat detectors throughout the region. All of these are the regular duties and responsibilities of a regional wildlife biologist.

Aside from its expansive blueberry barrens, Region C is mostly known for its continuous undeveloped coastline dotted with uninhabited islands, exposed ledges, and 15-to-20-foot tides. This coastal ecosystem provides regional staff with many opportunities to get out on the ocean and explore Maine's state-owned islands.

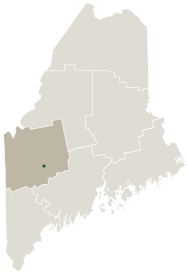
The Coast of Maine Wildlife Management Area (WMA) includes islands and ledges owned or managed by MDIFW, varying widely in size, shape, and habitat. Even though the WMA comprises over 300 islands and spans the whole coastline, most of the islands are located within Region C.

Guests, volunteers, and other MDIFW staff members have embarked with Region C this year on boat trips to survey birds or check on island conservation easements. Nate Webb, MDIFW wildlife division director, and Ryan Mola, stewardship director at Downeast Coastal Conservancy, came aboard the Region "Sea" to do a conservation easement site visit at Huckins Island in Cobscook Bay.

Region C biologists have also been deploying bat detection units on some of the region's state-owned offshore islands to determine bat species presence and abundance. The data we gather will give us critical information on how bats are using the offshore island ecosystem in down east Maine.

Finally, the Maine Bird Atlas, a large citizen science project, is in its final year of surveys. During the breeding season, we know that many colonial waterbirds utilize Region C islands as nesting colonies; but the wintering bird populations on some of these offshore islands and ledges are not as well known. One component of the Maine Bird Atlas has been wintering bird surveys; and so the Region C crew was tasked over the last few winters with surveying by boat for wintering birds near offshore islands and exposed ledges along the region's coast.

Prior to each survey season, project coordinators establish targeted priority blocks. Last winter, Region C biologists tagged along with Marine Patrol officers on their large vessel out of Jonesport to safely explore and tally birds further offshore. The winter of 2022/2023 will be the last of the wintering bird atlas surveys, and the Region "Sea" crew will be ready to set sail and put in more hours navigating the coast of Maine.



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Conserving Former Farmland and Fast Flying Falcons

Sarah Boyden

Giving New Life to an Historical Homestead on Hancock Pond

The Fahi Pond Wildlife Management Area includes three properties within the town of Embden. The Hancock Pond Parcel is located at the northwest corner of the Fahi WMA, covering 428 acres of early successional hardwood forest and including a hand-carry boat launch on Hancock Pond. In the 1800s, the Hancock Pond parcel was home to a farming community known for their cider orchards. Stone foundations and deep dug wells that were once part of the old homesteads can be found throughout the property, along with a few remanent apple trees hiding in the dense regenerating forest. Wild grapes drape the trees surrounding the stone structures, and small patches of irises and lilies are found throughout the property. It doesn't take much to imagine the farms of the 1800s in full production, with sheep, cows, horses, vegetable gardens, and humble flower beds surrounding the stone foundations. The view from Hancock Pond sweeps across the western mountains to some of highest peaks in Maine, including the distant Bigelow Range, Mount Abraham, and Sugarloaf Mountain.

In modern times, the farming landscape of Western Maine has shrunk to a small fraction of what it once was. Farming benefits many different wildlife by creating food and open habitat in an otherwise forested landscape. When the farms of the area were abandoned sometime in the early 1900s, fields grew up in dense patches of early successional, quick-growing forests. As those forests matured, the faster-growing tree species were replaced by longer-lived, mature species of maple, beech, and ash, along with pockets of hemlock, balsam fir, and spruce.

Recently, forest managers have harvested the mature forest of Hancock Pond, resetting the growth cycle and promoting the faster-growing, early successional tree species common during the post-farming era when fields began reverting to forest.

Early successional forests provide habitat and food for a variety of wildlife species. The dense young forest at Hancock Pond is preferred ground for ruffed grouse, whose drumming can be heard throughout the property, along with the early spring peenting and strutting display of American woodcock. Areas of disturbance created during forestry harvest often grow in with dense thickets of berries and other fruiting shrubs and trees, including raspberries, blackberries, blueberries, and cherries. These species provide important food sources, but most will not persist as the forest ages; instead, they will be replaced by mature, longer-lived trees.

As land managers, we can mimic the wildlife benefits of early successional forests by introducing diversified wildlife habitats onto the landscape. At the Hancock Pond parcel, we have begun to implement small projects that increase food availability, nesting habitat, cover, and forage. As a nod to the farmers who worked the property in the 1800s, we planted a small orchard of dwarf apple trees that will provide an abundant food source for many wildlife species including deer, bear, turkey, and grouse. In the early spring, apple flower blossoms will provide an early source of pollen for a variety of pollinator species. Importantly, these apple trees will not be treated or sprayed with pesticide chemicals. Although the resulting apples will likely be full of holes and not aesthetically

Caption

pleasing, there will be no ill effects to pollinators. Plus, worms and insects attracted to the apples (what most consider apple tree pests) will provide additional food sources for birds and small mammals.

We selected dwarf apple trees for a couple of reasons. First, they produce fruit much sooner than standard apple trees, which take several years to mature from bare root stock. Second, they are easy to maintain. With their lower branches, pruning is much easier for land managers. Those low branches also make fruit more accessible for deer and bear. Already, even though they're just in the sapling stage, wildlife gravitates to the cleared area surrounding the trees. Grouse and turkey can often be found taking dust baths in the dirt around the trees and snowshoe hare are found along the edges of the orchard clearing, sampling the newly emerging vegetation. Bare soil surrounding the trees will be planted with a low-growing clover mix that will not compete with the apple trees' nutritional requirements but will provide cover for small mammals and browse for turkey, deer, and bear.

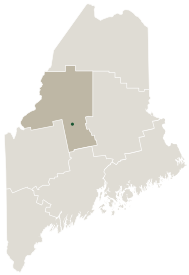
Protecting the Peregrine Falcon

Peregrine falcons, like many other bird species, faced drastic population declines in the recent past due to the effects of DDT, and in the 1960s they were considered extirpated from Maine. Thanks to intensive work including the banning of DDT in the early 1970s and a peregrine falcon reintroduction effort in the 1980s and '90s, Department biologists and other conservation partners recently documented 27 successful breeding pairs and 41 total pairs of the species throughout the state over the course of one year.

Peregrines are listed as endangered under the Maine Endangered Species Act. Given their status, regional biologists often work with private landowners to minimize impacts to nesting peregrines on their properties. Recently, driving past a former paper mill in central Maine, I noticed white guano streaking at the top of the old smokestack — the telltale sign of a peregrine falcon perch point. Peregrines are known for finding high spots to hunt from, often targeting the abundant pigeon populations found at both active and inactive mills.

With a small amount of survey effort, we located the peregrine nest on a windowsill in an old part of the mill and helped coordinate with the Department species specialist and the mill owner to ensure the nest would not be disturbed. In these situations, if necessary, we will create alternative nesting platforms or boxes to encourage the birds to nest in a location that won't interrupt the private landowner. If relocating a nest isn't an option, we monitor the nest and advise the landowner once the nestlings have fledged, allowing the owners to coexist with nesting peregrines. In most cases, the landowners are happy to accommodate, and are often excited to watch the pair raise their young.

Peregrines are dramatic avian hunters, reaching speeds over 200 mph to capture their bird prey. Given their affinity for urban environments, we occasionally hear observations like the one from ticket holders waiting in line at a local concert who watched a peregrine dive bomb a pigeon in the middle of the parking lot. It wasn't the show they came for, but not something they will soon forget.



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Caught on Camera: The Use of Cameras to Help Manage Wildlife

Scott McLellan

The Maine Department of Inland Fisheries and Wildlife (MDIFW) is tasked with monitoring and managing all of Maine's fish and wildlife species. Biologists are trained to explore and determine the most efficient and cost-effective methods of monitoring wildlife populations – specifically, whether a population exists in certain areas, and if so, whether it is increasing, decreasing, or stable.

One method of gathering population-specific information is through the deployment of game cameras. Not every wildlife species is easily detected using cameras, but some such as moose are. In 2021, MDIFW began a partnership with the USGS Vermont Cooperative Fish and Wildlife Research Unit to monitor moose. This was part of a larger Northeastern U.S. effort to research and understand regional moose populations, driven by a 30% decline of moose populations in northern New England over the past 20 years. Part of this plan involves using game cameras across the core moose range in northern Maine. We have chosen areas that we have long-term population data from and continue to collect data from annually using methods such as aerial flights.

While moose are the primary focus of this study, the camera protocol is designed to collect information from a wide variety of mammals from American marten to fisher to snowshoe hare. Currently, we monitor 80 game cameras in areas north of Moosehead Lake. Every three months, we visit the cameras via snowmobile, ATV, or on foot to perform required maintenance (battery and SD changes, for example). These cameras are situated on natural game trails, edge habitats, or funnel areas that would attract free ranging wildlife, and are placed significant distances apart from each other so that they don't photograph the same animals. Additionally, each camera site has a marked stake for recording snow depth (in 2-cm. increments) during fall, winter, and spring, a vial with an attractant (skunk essence), and a turkey feather. The purpose of the skunk essence and feather are to draw certain species closer to the camera for a better photograph.

This project will give us excellent insights into a multitude of mammalian wildlife species in a remote part of the state that is otherwise difficult to get information from. We expect to yield management-related information from species such as fisher, snowshoe hare, white-tailed deer, American marten, and, of course, moose. We may not gather quite as much information on smaller species such as long and short-tailed weasel that are fast and don't stay near camera sites for long.

Biologists will continue to explore and learn what these cameras can reveal. Based on past experiences using cameras to study white-tailed deer and other species, we expect to gain specific information on moose survival, recruitment (survival of young to a specific age class), density, sex ratios, population trends, and more. Upon review and analysis of the data by a team of researchers and managers across the northeastern U.S., final results will be pooled and tallied. We will compare these with other data that we collect during the two-year survey period using different (off-camera) scientific methods, as a measure of double-checking results.

Roach River Wildlife Management Area

Scott McLellan

Roach River Wildlife Management Area (WMA) is one of two such conservation areas in the greater Moosehead Lake region. MDIFW acquired Roach River WMA in 1990 to protect and promote vital fish and wildlife habitat amidst growing pressure from developers. Roach River resides north of Greenville and to the east of Moosehead Lake, adjacent to Kokadjo. This river is the most important Moosehead Lake tributary in terms of spawning and nursery areas for landlocked salmon and brook trout, so the acquisition three decades ago was a critical conservation move.

The WMA spans 6.3 miles, connecting First Roach Pond to Moosehead Lake's Spencer Bay, and is one of only two major inlets to Maine's largest body of water. MDIFW's ownership includes both the water and a 250-foot strip of woods (from the high-water mark) along each side of the river, plus an additional 250 feet of easement along the 6.3-mile river. Exceptions to this continuous ownership include a few small leases with permanent structures on the east end. The 250-foot strip of mature, softwood-dominated woods on each side of the river provides important habitat for a medley of wildlife including American marten, river otters, mink, white-tailed deer, fisher, reptiles/amphibians, songbirds, waterfowl, and birds of prey. This riparian zone functions as a permanent home for some, nesting habitat for others, a travel corridor for certain species, and a foraging and resting point for many.

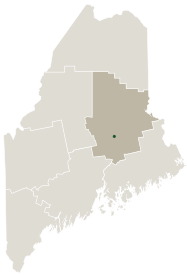
Recreational activities such as fishing, hunting (except baiting for black bears), trapping, birdwatching, and canoeing/kayaking are permitted and encouraged.

For those seeking angling opportunities, the river offers seven major access points (three along the Roach River North Road off the Spencer Bay Road, two along the Hardwood Valley Road south of the river, and two in Kokadjo near the river's origin). All access points except one (the one at the dam along Lily Bay Road) require a five to 15-minute walk to reach the river's edge, and their parking are not obviously marked as such. The trails are generally easy to follow, with flagging tape occasionally tied to tree limbs to help guide anglers. Additionally, there are brown boxes with informational cards at many of the trail heads for anglers to record their time spent and results. Fisheries biologists then use these data to make informed management decisions.

Many of the 69 WMAs across the state require some level of wood harvesting to promote or maintain a particular habitat type, which in turn helps out a focal species. For example, if the primary goal of the WMA is to provide quality ruffed grouse habitat, we will plan to harvest within hardwood-dominated stands on a frequent basis. At the Roach River WMA though, since the wood is so close to the river, there is no harvesting (both for legal and conservation purposes). Instead, the goal is to maintain a wooded buffer along the river to protect it from the sun and keep water temperatures cooler, preserving and sustaining the fishery there and in Moosehead Lake.

Angler box at Roach River

Roach River Wildlife Management Area



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Monitoring Maine's Waterfowl

Connor White

Duck Banding

The great state of Maine is home to 34 species of waterfowl for at least part of their annual migration, staging, or breeding cycles. These waterfowl can be classified into four generic types: dabbling ducks, diving ducks, sea ducks, and geese. In the 1980s, North America's overall waterfowl population began to decline, prompting the Maine Department of Inland Fisheries and Wildlife to prioritize management efforts to conserve these species. Waterfowl biologists, hunters, and enthusiasts across the continent have long advocated for the preservation and management of waterfowl habitat to ensure healthy populations for future generations. To date, of Maine's 100,000+ acres of Wildlife Management Area (WMA) land, roughly half serves as important waterfowl habitat. An added benefit to conserving waterfowl habitat is that it is also utilized by declining invertebrate species, bats, loons, wading birds, amphibians, deer, moose, and a variety of Maine's species of conservation concern.

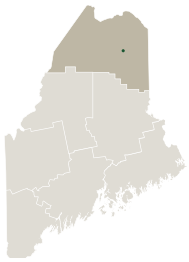
Maine's regional biologists install and monitor duck boxes on WMAs to provide nesting opportunity for cavity nesters such as wood duck, goldeneye, and hooded merganser. In the spring, we visit the duck boxes, count eggs, and band nesting adult females. During the early summer, we perform brood surveys to measure nesting success. This involves paddling waterbodies searching for hen waterfowl with their ducklings. During the late summer and again in winter, we capture flocks of waterfowl, apply leg bands and GPS transmitters to monitor movement and mortality, and collect bio-samples for disease surveillance. Biologists will also perform winter waterfowl surveys along the coast of Maine via watercraft and airplane to collect data. In late winter, we visit duck boxes across the WMAs to document nesting attempts vs successful hatching. We also manage water levels using pre-existing dams, and in certain situations we introduce beavers to WMAs to promote interspersion within the waterway.

Overall, to confidently monitor waterfowl populations, biologists perform egg counts and brood surveys, apply GPS transmitters and leg bands, conduct winter bird counts, and sample for diseases to measure recruitment, movement, and survival rates. Waterfowl are migratory species that don't adhere to state or country borders, so our agency cooperates with other states and provinces within the Atlantic Flyway to assess their population trends. By comparing hunter harvest data with brood and band return data across the Flyway, we can monitor population trends at the species level. Estimates generated from this data allow biologists to determine whether waterfowl species are increasing, decreasing, or stable.

By knowing the trend and movement of a species, we can adjust bag limits and hunting seasons accordingly. For example, through our management efforts, we have noted a gradual decline in mallard populations across the Flyway, while hooded merganser populations have been increasing. To meet management objectives for these species, The Flyway has increased the bag limit for hooded mergansers and decreased the mallard daily bag limit. As populations continue to change across the Flyway, harvest limits for certain species will change, too. As biologists, we will keep striving to collect the most accurate and valuable data, so that any resultant management or regulation changes will ensure healthy waterfowl populations for future generations.

Many of our regional WMAs offer ample waterfowl viewing and hunting, along with other outdoor recreation. We encourage you to take a paddle on the Sawtelle Deadwater, go birding on Pond Farm, or float down the Mattawamkeag River. Our WMAs may be managed for wildlife, but they are open for all to enjoy!

Duck Banding



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Pollard Flats Expansion

Amanda DeMusz

The Pollard Flats WMA in Masardis was one of Aroostook County's smaller WMAs until 2021, when it doubled in size from 223 to 505 acres with the purchase of an abutting property. This purchase served many functions, adding valuable habitat protections as well as guaranteed public access to the WMA.

The original parcel only had official public access via the Aroostook River on the WMA's eastern boundary. Access via land was limited due to a private access road. With purchase of the additional acreage, the Department now owns the road access to the original parcel, plus additional acreage of mixed habitats to the west. There are now two land access points off the Garfield Road, providing sportsmen and non-consumptive users access to enjoy this WMA's bounty of flora and fauna.

Within the Pollard Flats WMA, a diverse mosaic of grassland, upland, and wetland resources provide habitat for a wide range of species. The original parcel contained mostly grassland and wetland habitat types, both of which are valuable and declining in Maine. The new acreage increased the WMA's grassland resources and significantly increased its wetland resources, while adding a valuable upland interface to the property.

Moose walking across field

Grassland habitat has been the focus of management on much of the original parcel. We have used a combination of mechanical rotational mowing and prescribed fire to maintain the grassland and ensure habitat for species such as bobolink and American Kestrel. In the summer of 2021, the newly acquired fields were mechanically mowed to remove shrubs that had grown in and to begin restoration of the grassland. We will add this new acreage to our rotational management on the WMA to create additional resources for grassland birds.

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Wetland habitat has been the second focus of management on the original parcel. In the past, we applied wetland restoration activities to bring back the quality of the wetland on the WMA. The new parcel was purchased with a focus on wetland habitat and with funding from Maine Natural Resources Conservation Program (MNRCP). It has a variety of wetland and aquatic resources including forested, scrub-shrub and emergent wetlands, perennial streams, ephemeral drainages, and a series of beaver dams that have added to a diverse open wetland area. Each of these wetland types provides valuable ecological functions and habitat for a variety of species from invertebrates to salamanders and even moose.

Access point improvements are underway and will provide the public with safe access to the many resources available in this lightly visited property. In the spring and summer, you can enjoy the colors of the grasslands and plethora of avian species singing away the day. In the fall, the uplands and grassland edges offer opportunities for grouse, woodcock, and waterfowl hunting, as well as beaver and muskrat trapping. And in the winter, strap on some snowshoes or backcountry skis and enjoy the variety of animal tracks in the snow. Any time of year, Pollard Flats has a lot to offer the outdoor enthusiast, and we are very excited about the opportunities this recent expansion provides for you to enjoy its bounty.

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State Parks Provide Habitat for a Rare Rabbit

Sarah Spencer

Maine's State Parks and Historic Sites provide space for recreation and education all across Maine, from camping with friends and family to paddling, fishing, hiking, picnicking, or relaxing on the beach. These special places are also home to some of Maine's rare, threatened, and endangered species.

One role of the MDIFW biologist assigned to Bureau of Parks & Lands is to work with these sites' managers to conserve and protect wildlife. This means something different for each species and site: at some sites, it's necessary to keep trails closed during sensitive times of year. At others, we enhance habitat by altering characteristics of vegetation or providing artificial structures for nesting and protection. One such species that needs the latter level of help is the New England cottontail – Maine's only native rabbit.

The New England cottontail's range once included New England and New York, extending from midcoast Maine south to Connecticut and westward into eastern New York; but it is now restricted to six towns in York and Cumberland County. They are an entirely different species than the snowshoe hare, which is well-adapted to Maine's deep snow and long winters (and is a hare, not a rabbit). It is also not to be confused with the eastern cottontail, a nonnative rabbit that competes with the New England cottontail for habitat and is nearly indistinguishable without having them in hand or having DNA analysis.

In 2007, Maine listed New England cottontail as an endangered species; and in 2006, the U.S. Fish & Wildlife Service listed it as a candidate species for federal protection under the Endangered Species Act. In 2015, that designation was dropped because of the conservation actions being implemented across the New England cottontail's range by state and federal agencies, partner organizations, and individuals, all doing their part to protect the species.

Such actions have helped keep New England cottontails from becoming even more imperiled; and at three State Parks in Cumberland County, this endangered species is thriving. Crescent Beach, Two Lights, and Kettle Cove State Parks have the habitat characteristics New England Cottontails need to thrive; and Park staff, volunteers, and biologists are all working together to enhance it even more.

New England cottontails need shrublands and young forests to thrive. We refer to these areas as early successional habitats, meaning they are the first stages of vegetation to grow back after an area is cleared. If you look at an overgrown field or an extremely dense young forest that would be challenging for you to walk through, that's exactly the kind of area this species thrives in. With time, the dense shrubs and trees grow into older trees with sparse vegetation underneath, and at that point the habitat is no longer preferred by these rabbits.

Habitat enhancements at Crescent Beach, Two Lights, and Kettle Cove include several projects aiming to keep targeted areas from becoming older forest. Park staff mow fields and young shrublands annually or every other year to keep them relatively short and young, providing quality food resources for rabbits adjacent to established shrublands, while also benefiting native pollinators and songbirds. During the summer, we mow strips of grass just a few feet away from shrublands. The mown areas encourage growth of non-woody vegetation for rabbits to eat, and the adjacent shrubby patches provide cover from predators. A decade ago, we installed artificial burrows in dense shrub areas, giving rabbits a place to hide from predators year-round and raise their young in the spring and summer.

In shrublands, cherry, aspen, and maples are typically the first trees to become established, so when they reach 3-4 inches in diameter, biologists girdle them. Girdling removes the parts of the tree that move water (xylem) and nutrients (phloem), collectively called the cambium. We can use several tools for this, including a hand saw, draw knife, or hatchet. We recently added an electric chainsaw to our toolbox, which helps us girdle more trees in less time. When we do this in winter, the tree doesn't have the ability to move water into the branches to produce leaves in the spring, so the part of the tree above the ground dies, keeping it from shading out the shrubs underneath. Trees like aspens will then use the sugars and nutrients in their roots to send up shoots from the root system, providing a food source for rabbits the following winter. Similarly, maples will sprout new shoots from the stump. At State Parks we do this on a relatively small scale, girdling individual trees in small areas to keep a steady supply of short, young woody stems to feed New England cottontails.

New England Cottontail

In addition to the mowing and girdling, we added two more management actions to the list in winter 2021/22. The first was clearing of shrubby growth along the edges of hiking trails and other key areas to encourage growth of summer food adjacent to protection from predators, and the second was to remove small groups of non-native invasive shrubs from old fields and replace them with shrubs native to the ecosystem, which provide higher quality habitat for New England cottontail, birds, and invertebrates. State Park staff have established a dedicated group of volunteers who got started on some of the shrub clearing during the winter, and we are all looking forward to engaging more volunteers with these projects in the future.

If you find yourself in one of these special State Parks and see a rabbit, take a moment to appreciate this endangered species and all the efforts underway to keep them around for generations to come. Remember to always keep your distance and keep pets on a leash to prevent any unwanted interactions. To learn more about how you can help, visit **www.newenglandcottontail.org.**

LANDS MANAGEMENT PROGRAM

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Habitat Management at Frye Mountain Wildlife Management Area: Compartment F

The MDIFW Lands Program Team

Operating within MDIFW's Wildlife Management Section, the Lands Program supports the work of wildlife biologists by planning and implementing habitat enhancement and maintenance projects on State-owned Wildlife Management Areas (WMAs).

The Frye Mountain WMA is no stranger to these projects. It has seen a variety of operations over the decades to maintain and enhance the forest and field habitats for many different wildlife species. For the past two years, Compartment J has been the focus of a timber harvest operation that is slated to finish this coming winter. The next area scheduled for treatment is Compartment F, situated in the southwestern corner of the 5,000-acre WMA. Located entirely in the town of Montville, this 472-acre compartment can be accessed by road from the south using Morrill Rd. or from the north using High Bridge Rd. High Bridge Rd. can be accessed by Walker Ridge Rd. if coming from Rte. 220, or Frye Mt. Rd. if coming from Rte. 137.

To help facilitate operations, we will be improving High Bridge Rd. to make trucking easier, reduce road degradation, and reduce sedimentation of nearby water resources. We will also be building two new roads so that we can more economically harvest the area, more easily perform field mowing, invasive plant control, apple tree pruning, and other management activities, and give the public better access to this mostly isolated compartment. This road work is slated to begin in fall 2022 so that timber harvesting can begin in winter 2022/23.

Figure 1. Compartment F is outlined in pink. Leaf off imagery clearly shows the network of maintained fields and matrix of hardwood, softwood, and mixed wood forests.

In 2020, MDIFW developed a Forest & Wildlife Management Operations Report, also known as a harvest prescription, for Compartment F. The Lands Program staff cruised and inventoried the entire compartment and have set wildlife habitat management goals and objectives based on current forest types, soils, and habitat features. We planned and developed these goals and objectives in coordination with wildlife biologists from MDIFW and Maine Natural Areas Program (MNAP). The proposed operations in the report are subject to competitive bidding through Maine's Division of Procurement Services to ensure equal work opportunities for qualified businesses.

Compartment F features a variety of forest types including oak-beech and oak-pine uplands, northern hardwoods, hemlock, and spruce-fir. It also has maintained fields, as well as open water, scrub-shrub, and forested wetland habitats. This wide range of habitats presents numerous opportunities for enhancement through thoughtful silviculture.

Like much of Maine, Compartment F was once heavily cleared for agricultural use. Many stone walls, cellar holes, and barbed wire fences buried deep into the trunks of trees tell us that the landscape was mostly not forested. While farm abandonment would have happened slowly since the end of the Civil War, much of the forest in Compartment F originated when the farms located there were sold to the Federal Government during the Great Depression. Tree cores and the natural mortality of mature balsam fir and intolerant hardwoods corroborate this. With these clues, we can age much of the forest to be between 80 and 110 years old. Because of this land use history, Compartment F lacks vertical or horizontal structural diversity and has stands of intolerant hardwoods and fir that are in the process of collapsing.

To remedy this, we plan to regenerate portions of the compartment to a younger age class through single tree selection and small and large group selection treatments. In doing so, we will remove the short-lived, pioneer tree species such as paper birch, aspen, and balsam fir. This will establish a new generation of trees, increase structural habitat diversity, and improve tree species diversity. Thinning treatments will remove trees of low vigor to give healthier residual trees more space and resources to grow.

Cavity trees, standing snags, rare trees, and other "wildlife" trees will be left regardless of silvicultural treatment to aid in nesting, roosting, and hibernation. Management operations may also include the cutting, felling, and on-the-ground retention of three to six low-quality pulpwood trees per acre. This will add coarse and fine woody debris (CWD) to the forest floor, enhanc¬ing the habitat for invertebrates, amphibians, and reptiles. Cumulatively, these management techniques will aid the forest in its natural progression and create a more natural forest ecosystem to benefit as many wildlife species as possible.

Upland areas will be managed for hard mast (nut) production, prioritizing northern red oak and mast-producing American beech for their value as wildlife food sources. Other upland areas will be managed for red oak and eastern white pine, which together provide a mix of acorns and pine softwood cover that eastern wild turkeys love for roosting.

In general, we will manage the mid-slope areas, which are composed of northern hardwoods, with single-tree and small-group selection methods to promote long-lived, shade-tolerant northern hardwoods species. These include sugar maple, yellow birch, white ash, American basswood, and red oak. This will eventually create an uneven-aged forest with a varied structure suited to a wide variety of wildlife. All at once, it will include newly regenerating areas with woody browse and herba¬ceous plants, mature trees for cover, trees with cavities, and trees bearing nuts, seeds, and catkins for food.

We will primarily manage the lowland areas to maintain and improve the mixed and softwood cover already growing there. Thinning and single-tree selection to remove intolerant hardwoods, fir, red maple, and overtopped or otherwise low-quality trees will release and encourage the regeneration of longer-lived softwood species like hemlock, red spruce, and cedar. These more mature softwood-heavy stands in low lying areas near water resources make for excellent deer wintering areas due to their protection from the elements, with overlapping crowns of hemlock preventing deep snow accumulations and offering refuge from wind and cold nights. Sprouts from red maple and other hardwood stumps also provide a winter food source.

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Figure 2. The current over-mature condition of the field edges at Compartment F.

Figure 3. Ideal field edge conditions, as seen at the Ruffingham Meadow WMA.

We will use even-aged treatments like overstory removals and clear cuts in select locations to create and maintain young hardwood forest habitat adjacent to fields, alder flats, and wetlands for the benefit of Ruffed Grouse and American Woodcock. Compartment F features several boomerang-shaped fields that in some cases are only separated by several feet of trees and woody vegetation. The original intent of these fields was to maximize the amount of "edge" habitat that grouse like to use for nesting, foraging, and cover; but the wooded strips between the fields are aging out of ideal grouse habitat and becoming mature forest. The centerpiece of the Compartment F prescription is a 30-acre overstory removal that encompasses the wooded strips and forested edges of nine fields to bring them back to a younger age structure with trees that are small and dense for cover but has enough light on the edges to promote soft mast-producing shrubs for food and additional cover.

As we plan and implement habitat management across Com¬partment F, we will also need to manage invasive plant species so that desirable native species and herbaceous plant communities can establish themselves, develop, and regen¬erate. An invasive plant is defined as a plant that is not native to a particular ecosystem, whose introduction causes, or is likely to cause, harm to the economy, environment, or human health. A handful of invasive plant species, including non-native honeysuckle, multiflora rose, Japanese barberry, Asiatic bittersweet, and others have been found in abundance on the Frye Mountain WMA; Compartment F is no exception. In collaboration with MNAP, we have implemented a multi-faceted plan to survey and treat these species on the compartment, both pre- and post-harvest. This is important because timber harvests can exacerbate problems with invasive plants by inadvertently releasing them from overstory competition instead of the native plants and trees that we want to grow.

Long-Term Ecological Benefits of Deer Wintering Areas (DWAs) and Northern Conifer Forest Management

Daniel Hill

Northern, Eastern, and Western Maine's whitetail deer are at their northern range limit due to the severity of winters in those parts of the state. Maine Department of Inland Fisheries and Wildlife (MDIFW) is responsible for improving Deer Wintering Area (DWA) habitat conditions throughout these areas to help deer survive the significant snow depths, cold temperatures, and long-term resource restriction. To that end, MDIFW is working with landowners and local conservation organizations to acquire, manage, and assist with managing DWAs. This is one strategy we are using to meet our whitetail deer management objectives. Maine's whitetail deer require a more mature spruce-fir softwood-dominated forest with a minor hardwood component to help protect them from the harsh elements from December through April or even May, depending on the year and location. The mature softwood provides cover from snow accumulations and severe winds, while the hardwood provides a source of winter food within proximity of shelter. Deer in these areas are considered migratory, travelling as far as 75 miles to find these habitats with the components that will help them survive until the spring. The more acres of quality wintering habitat, the more deer that will utilize them, and the more successful Maine's deer populations will be at surviving the winter long-term.

A softwood dominated Northern conifer stand in winter Photo by Daniel H. Hill.

DWAs also provide seasonal and year-round benefits to a suite of other wildlife species. A lot of times, they border riparian, lowland wetland, or forested wetland ecosystems, and provide connectivity and habitat for other mammals, birds, reptiles, amphibians, invertebrates, and more. Some such wildlife species include fisher, snowshoe hare, American beaver, merlin, American three toed and black-backed woodpeckers, rusty blackbird, pine grosbeak, spruce grouse, Northern saw-whet owl, and great blue heron.

Vernal pools are integral components of a forested ecosystem and are found throughout Maine's northern conifer forests. Just some of the species that utilize vernal pools within DWAs include reptiles and amphibians like wood frog, green frog, blue-spotted salamander, spotted salamander, common gartersnake, and painted turtle, as well as invertebrates like freshwater mussels such as creeper, Mayflies such as the Tomah mayfly, dragonflies such as pygmy snaketail, and butterflies such as the Clayton's copper. Some of the species listed above are common, while others are threatened, endangered, or species of special concern in Maine. Long-term vernal pool management will improve water quality and the diversity of flora and fauna species associated with these habitats.

The northern conifer or Acadian forest type is found in northern Maine, eastern Canada, and higher elevations in northern New York, Vermont, and New Hampshire (Braun 1950). It lies in a transition zone between the boreal forest and the eastern temperate forest and is characterized by spruce species and balsam fir with components of eastern white pine, northern white cedar, eastern hemlock, and hardwoods including red maple, aspen, and birch. The northern conifer forest was historically called the spruce-fir forest, as its primary timber species were balsam fir and red, black, and white spruce. (Source and Credit to: Northern Conifer Management by Granstrom et. Al.)

Silvicultural techniques associated with DWA management include a suite of activities to improve the overall forest health and strength of trees after management activities. One technique that can be used to assist with the development of a more mature Northern conifer forest is precommercial thinning (or PCT). PCT is commonly utilized to intervene with forest development at a softwood stand's younger stage to enhance its species makeup and overall hardiness. A forester and biologist set a species priority list based on the site's conditions, including promotion of the strongest individual trees and tree species for the stand's future development. This list will include longer-lived quality softwood species (spruce, Eastern hemlock, Northern white cedar, and balsam fir) to promote a softwood dominated habitat. The tree types and species that will be removed first are hardwoods (red maple, sugar maple, paper birch, yellow birch, and ash) and lower-quality softwoods that will not benefit the stand as it matures. Individual hardwoods that are removed tend to resprout, providing a reachable food source for deer as the stand develops. In a DWA, the goal of PCT is to assist with stand development and transition younger softwood stands to a more mature condition in a shorter amount of time, while also providing a food source for the deer within proximity of developing shelter.

A young softwood dominated Northern conifer stand in winter. Photo by Daniel H. Hill

Works Cited

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